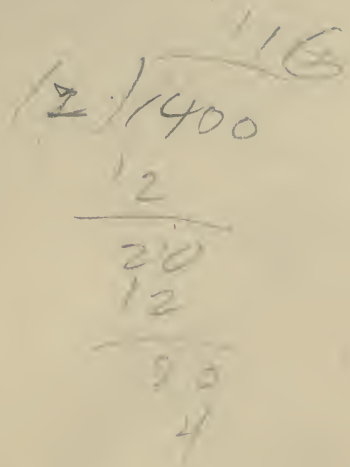
HOW NATURE STUDY SHOULD BE TAUGHT

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HOW NATURE STUDY SHOULD BE TAUGHT

INSPIRING TALKS TO TEACHERS

BY

EDWARD F. BIGELOW, A. M., PH. D.

With an Introduction

BY

J. P. GORDY, PH. D., L. L. D.
Professor of Pedagogy, New York University

AND

Suggestions as to the Proper Method of Introducing Nature Study

BY

H. A. SURFACE
Economic Zoologist of Pennsylvania and Professor of Zoology in the Pennsylvania State College



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FOREWORD.

THE author was, for eight years, the editor of "The Observer," a magazine for naturalists; for three years editor of "Popular Science," and for the past five years he has been the editor of the department of Nature and Science in "St. Nicholas," a magazine for young folks, and as a lecturer and teacher he is not without experience in the department of study which this book aims to treat. For these reasons, and for others which we will allow the reader to discover, he has prepared the book, hoping, like the author of every similar work, to help, instruct, and perhaps inspire, the earnest teacher, whose lot is always a laborious one, whose leisure is always scanty, but whose final reward is certain and great.

Many of the chapters that compose this book were originally published in "The Popular Educator," Boston, Mass.; others are reproduced from "The Journal of Education," Boston; "The School Journal," New York: "School Science," Chicago; "The Ohio Teacher," Athens, Ohio.

Thanks are due the editors for much kindness and courtesy.

The writer gratefully acknowledges permission from the author and the publisher, to reprint, from the report of General Z. T. Sweeney, Fish and Game Commissioner of Indiana, the valuable paper, "How to Introduce Nature Study," by Professor H. A. Surface, Supervisor of Nature Study in Pennsylvania.

To Professor J. P. Gordy, Ph.D., LL.D., Professor of Pedagogy of the New York University, the writer thankfully acknowledges his obligation for the favor that Dr. Gordy shows him and the reader, by allowing the publication here of the suggestive, helpful and inspiring Introduction.

Where our Mother Nature lives, there is our Dulce Domum. The children of her home are the little brothers of ours. Among all the teachers she is the greatest, and she is ours. What she tells us, "children of a larger growth," shall we not tell ours, of fewer years and more impressionable minds, who cluster about us in the schoolroom, and in our own particular Dulce Domum? To help the reader in this, is the purpose of this book.

INTRODUCTION.

BY PROFESSOR J. P. GORDY, PH.D., LL.D.

EVERY revolution in the history of thought is followed by a revolution in the history of education. It was so in the fifth century before Christ, when the Sophists discredited the idea that the individual exists solely for the State; it was so in Rome two hundred years later, when the old Roman ideal of citizenship gave place to the Greek ideal of individualism; it was so at the beginning of the Middle Ages, when the pagan ideal of culture and enjoyment was supplanted by the ideal of monasticism; it was so at the beginning of the Renaissance, when the ideal of asceticism and self-denial gave place to the ideal of enjoyment and self-culture; it was so in the nineteenth century, when the vast enlargement of our knowledge of the physical universe and its varied application to practical uses, transformed men's attitude towards nature, and made them realize that a servant of almost infinite power stood ready to obey them, whenever they learned enough about the

world to be able to speak the right word of command.

Spencer's famous essay, on "What Knowledge is of most Worth?" may perhaps be said to mark the beginning of the corresponding revolution from the standpoint of theory. For though Bacon and Comenius had insisted on the importance of a knowledge of things, they were as voices crying in the wilderness. When so great a scholar as Erasmus could urge no reason for studying nature except that it would throw light on literature, it was out of the question for others to get a hearing, who insisted, not only that nature was worth investigating on its own account, but that it was the most important subject of study. It was not until the slow progress of discovery and invention had gradually changed men's attitude towards the physical universe, that the appearance of a brilliant and extravagant essay like Spencer's, which put forth the claim that science was the only subject worth studying, could form an epoch in the history of education.

It hardly needs to be pointed out that this revolution in the history of thought has found its practical expression in the history of education. The elaborate and expensive laboratories for the

study of physics, chemistry and biology; the organization and multiplication of scientific and technical schools; the great variety of courses for the study of science; the conferring of degrees upon the completion of curricula in which science is by far the largest element, are a few of the expressions of this revolution in the field of education, as is the insistence upon nature study and elementary science in our primary and grammar schools.

But the stress which is being laid upon the study of science is due, not only to the change in our attitude toward nature, but also to a change in our attitude toward education. Formerly, the question was, What does a man need to know? Now the question is being asked, What does he need to be? It is the emphasis upon this question, in the minds of the leaders of educational thought, which is making it clearer and clearer that we need a knowledge of nature, not only because we want to be able to talk with one another across the ocean; to be able to tunnel our mountains and to throw huge bridges across our rivers, and to navigate the air; not only because we want electricity and steam to do the mechanical work of the world, but because we want to be

men. We are beginning dimly to perceive that the change produced by the study of science upon the mind of man is hardly less great than the change which that knowledge produces in his power over nature.

There was a time when men crouched in abject terror of nature; they trembled at the sound of thunder; they fell on their knees in the presence of an eclipse; a hurricane was the breath of an evil spirit, and an epidemic the expression of the wrath of an offended deity. Nature was an enemy; her powers were wielded by demons, to make the brief and wretched lives of men briefer and more miserable still. Ignorance of nature and the wildest and most fantastic superstitions went hand in hand. The inability to use natural forces involved the inability to think clearly. The inability to command nature by obeying her, involved the inability to understand man's relation to her. He who should stand erect in her presence, and, through penetration of her secrets, command her to do his bidding, crouches in terror before her, and thinks of himself as her victim and toy, and plaything, whenever he fails to understand her. It is as though our beneficent teacher, nature, would beguile us into getting the training

which we need as men, by making it depend on the knowledge which we need for the practical purposes of life.

Is, then, the imparting of a knowledge of nature the one purpose of nature study? To show that it is not is one of the chief purposes of Dr. Bigelow's book. He never tires of insisting upon the difference between elementary science and nature study, because the primary purpose of elementary science is the imparting of scientific knowledge, and the development of habits of scientific thinking, while the primary purpose of nature study is the development of a love of nature. Of course knowing cannot take place apart from feeling, nor feeling apart from knowing. But the cold love of truth, the feeling that the teaching of science seeks to awaken, is a vastly different experience from the feeling of love or of admiration for an animal, or an object,—which the teaching of nature study seeks to awaken. And the concentration of the attention upon the universal aspects or phases (the class relations) of objects, which the teaching of science seeks to bring about, is an entirely different thing from the concentration of the attention upon an object as a whole,—upon those characteristics which make it an individual,

which the teaching of nature study seeks to bring about. You may talk to a boy about the resemblances between a cat and a tiger, in the hope of developing an interest in the relations of animals; if so, you are teaching elementary science, and are trying to stimulate his love of truth. Or you may try to get him to look at a cat as an object not to be pelted with stones, but as a living thing, one that responds to affectionate treatment with affection; if so, you are teaching nature study, and are trying to develop a love of animals. You are making a certain appeal to the intellect in both cases, but in the former, you do not want the boy to consider the cat as an individual at all, for one cat will serve the purpose quite as well as another, since it is the cat as a member of a class in which you wish to interest him; in the latter, it is the cat as an individual, a being with a capacity for individual pleasures and pains, such as the boy himself is conscious of, that you wish him to have in mind. Succeed ideally in the former attempt, and he will not only be perfectly ready to dissect his cat when dead, but to vivisect it when alive, if he can learn something about it that he wishes to know; succeeded ideally in the latter, and he becomes the friend of all living things, and will

quiver with indignation at the infliction of unnecessary pain upon any animal.

Upon second thoughts, however, it is plain that this illustration suggests more than the truth. It is indeed true that elementary science aims to develop an interest in types and classes, while nature study seeks to awaken an interest in objects and individuals. It is also true that the interest which science seeks to arouse is the love of knowledge, while that which nature study would stimulate is some sort of appreciation of an object or an animal. But it is not true that an intense love of knowledge, unaccompanied by the proper development of the emotional nature, has only bad results, nor is it true that a development of the emotional nature unaccompanied by a proper development of the intellect, has only results that are good. Develop the intellect abnormally along with the love of knowledge, which is its inevitable accompaniment, and you have indeed trained a being of the temper of Spinoza, who knows no love nor hate, who responds to no enthusiasm except that which results from the contemplation of the reign of law, who is willing to eliminate all individuality from the universe, to resolve it into the expression of necessary and eternal laws,

because there is nothing in the nature of such a being which demands a world of individuals. But it is equally true that to develop the emotions abnormally, is to develop a being of the temper of Rousseau, a "weltering mass of sensibility," impelled this way to-day and to-morrow that, according as the wind of emotion blows north or south, saved, if saved at all, from debasing superstitions only because he passively accepts the results of other men's thinking. Succeed ideally with your nature study, we said above in commenting upon our cat illustration, and the boy will quiver with indignation at the infliction of unnecessary pain upon an animal. It is now clear that such a boy will never see the necessity for the infliction of pain, unless he has capacities which have not been developed by any training of his emotional nature. Manifestly what is needed is not a training either of the head or the heart by itself, but of the two in conjunction. As Pestalozzi put it, "Let not [the child] attempt to [climb the ladder leading up to Heaven] by the cold calculation of the head or the mere impulses of the heart; but let all these powers combine, and the noble enterprise will be crowned with success."

Nevertheless, the half of the truth upon which

Dr. Bigelow insists is the one which most needs to be emphasized. I have said that the question which the leaders of educational thought are beginning to ask is, What does a man need to be? But it is not true that this question is uppermost even in the minds of most educated men when they are thinking of education; as a rule, men continue to think of themselves as means, not as ends. They look upon their physical and mental powers and capacities as tools for the accomplishment of work. They care more for education than they used to care, because they have learned that it increases their power to do things. Even in this democratic age, we do not undersand the truth upon which Sir William Hamilton used to insist, "On earth there is nothing great but man; in man there is nothing great but mind." It is ignorance of this truth which so often causes statesmen to confuse social progress with growth of wealth, spread of commerce, mere increase of population. Instead of agreeing with Aristotle that the object of the state is to promote good life, they are prone to concentrate their attention on the mere tools of life. They incline to plume themselves on their promotion of the "onward march of civilization," when they have merely promoted national devel-

opment, as though the increase of the mere means of existence necessarily made the life of any man better worth the living; as though such increase might not be made through the sacrifice of the best things in the world.

The same error lies at the bottom of our worship of success. Has the man *done* things? Has he amassed a great fortune? Has he risen to a high office? Has he made himself master of his party? Has he changed the map of the world? We ask, in a word, not what he is, but what outward success he has achieved, and if that success be great enough, we are perfectly willing to excuse him for any violence, no matter how great, which he has done to his own best self.

That is why we lay such undue stress on mere cleverness, pure intellectual ability. If you would get music, or drawing, or painting, or any form of art in the course of study in our schools and colleges, you must show that it develops the intellect, and thereby increases the power to do things. Say that the past generations of the race have bequeathed to us a noble inheritance in music, painting, literature, and that it is our business to enter upon that inheritance not simply because of any use we can put it to, or any power it will develop

in us, but because it constitutes an important part of the spiritual wealth of the world, and the practical man will not listen to you. He demands results, deeds, achievements, and has no use for a training which has anything else in view. He does not realize that the cultivation of the capacity for simple pleasures, for the pleasures of home, for a love of animals and of nature, may be the most practical thing in the world. He does not understand that a system of education which, while it seeks to enrich the student with the garnered wealth of all the ages, lays stress on homely joys and unassuming virtues, may still be as conducive to national well-being, and have as marked a tendency to promote what should be called civilization, as the system that aims at nothing except developing the capacity to do things, and a determination to employ it. Ruskin doubtless was guilty of a gross exaggeration when he said that "All other efforts in education are futile till you have taught your people to love fields, birds, and flowers." But if he had said that the development of the love of such things, in those who have a capacity for it, is second in importance to nothing except the forming of character, who could have questioned his statement?

Not only, then, is the emotional side of the child a thing to be cultivated, but it is equally true that this can be successfully done only through the emotional nature of the teacher. As the teacher reaches the intellect of his pupils through his own intellect, so he touches their emotions by means of his own emotions. That is why the teacher must himself love nature, if he is to succeed in influencing others with a love for it. As Dr. Bigelow puts it, "Do not talk to him [your pupil] about the lovableness of nature, if you have not the genuine article in your own heart, *heart*, not head." That remarkable characteristic of the human mind called by some psychologists plastic imitation, in consequence of which we tend to believe and feel as the people around us believe and feel, which explains the tidal-wave spread of enthusiasm that manifested itself in such great movements as the Crusades, in the prevalence of belief in witchcraft at certain periods in the history of the world, in the contagion-like communication of panic from man to man in a theatre, when a cry of danger is heard, and in the remarkable counteracting influence that may be exerted by a person who keeps his presence of mind, this characteristic

makes it impossible for the feelings of a pupil to be aroused by any purely intellectual activity on the part of the teacher. And this is true, of course, not only of nature study, but universally. Ideas may be conveyed by the intellect. But Ideals can be developed only by one who loves and cherishes them for himself. Not long since, the principal of a certain school was warmly praising his teacher of history. The originality of the teacher, his love of research, his skill in unravelling the tangled web of historical causation, were warmly commended. "Has he the philanthropic impulse?" asked the listener. "Does he seek to know the causes of what has happened, so that he may learn how the errors of the past may be avoided? Does his study of history present itself to him as the way in which he can best contribute "his personal efforts as bricks and mortar for building the walls of the free democratic city, the supreme refuge of human dignity?" To which was given the almost pathetic reply. "I don't know." From such a teacher light can come, but not that sort of stimulation that tends to transform the life.

Dr. Bigelow's "Tests of Proficiency in Nature-Study" will doubtless seem very ridiculous to

those teachers who are afflicted with the worst of all pedagogical manias, the mania for information. But they are perfectly sound, and we might apply the same tests to the teaching of history in a high school or a college. Has it strengthened your determination to do your own thinking in political matters, the pupil might be asked? Has it made you resolve that, come what will, you will never wear any party collar? Has it made you feel the infinite pathos of the situation, if it should eventually appear that after many centuries of struggle, humanity succeeded in throwing off the rule of an oligarchy of birth, only to succumb to the tyrannical and self-seeking rule of the oligarchy of a party organization? If the pupil can honestly answer such questions in the affirmative, he has studied history to the best possible purpose, even though he is confused as to many of the dates upon which the information-mad teacher is in the habit of laying so much stress.

In general, the Pedagogy of this book is entirely sound. The discipline of a school comes to seem an end in itself to the rigid disciplinarian. Not so to Dr. Bigelow. From the average teacher's point of view, the preservation of his

dignity is a matter of so much importance, that the child must be repressed whenever he does anything that might seem to be a reflection upon it. Not so from Dr. Bigelow's point of view. With him, discipline, teacher, subject, method, must all stand in the background. The child, and the child alone, has a right to the centre of the stage.

HOW NATURE STUDY SHOULD BE TAUGHT

CHAPTER I

WHAT IS NATURE STUDY?

The school-boy begins with a definition. "We will first define our subject. Webster says," etc. So, like the school-boy, I will begin with a definition, and thus impress upon my readers the fact that, in one respect at least, this article will harmonize with school-room experiences.

Speaking of Webster and definitions recalls an experience of boyhood, in "the old red schoolhouse."

It was "School Visitor," day, the last Wednesday of the term. School closed on Friday, but we were not expected to do much after the "Visitor" had been there. It was a terrible misfortune when the last day of the school term was "Visitor" day, for then we had no "after" ease!

Of course, on "Visitor" day we wore our Sun-

day clothes. I do not recollect all the events of the occasion, but a few things stand out with vivid prominence. First, there were my new shoes that pinched my toes, and squeaked dismally as I walked. My impression is that it was a quarter of a mile from the door to my desk, and what a row of people I passed in that journey!

There were Mrs. Brocker, who beamed at me over her spectacles in a sort of "I-know-you-and-guess-you-are-a-big-man to-day" sort of way; and Deacon Adams, with an indescribable twinkle in his eye. I thought he was making fun of me on account of my new shoes. Finally, I woke up the Visitor. He opened his eyes, and looked at me over his spectacles, and made my journey longer. He had a learned way of leaning back in his arm-chair, and "going to sleep," as we thought. Woe to the luckless youth that woke him up! But this time I escaped that disaster.

When the teacher had tapped on the desk, and told Frank to shut the door and put the water-pail in the corner, the Visitor said to her: "You may call out the class in 'Webster's Speller and Definer,'" and went to sleep again. He may have waked up more than twice during the class, but I do not remember that he did. Some of the parents

changed their seats, and we young folks lined up against the wall, from the door to the blackboard.

On the final wake-up for "Remarks," the Visitor said, "Now, I like a complete, well-rounded definition. You must know the thing, and then express it concisely and clearly. When you can do that with a common thing, it shows that you think clearly and can express your thoughts concisely. It's a good thing, not only to get acquainted with new words, but to define such a common word as 'boat,' for instance." And he went on to talk encouragingly of other school matters, but chiefly to tell what he did when he was a boy, as I have since learned that many mature men have the habit of doing. Impressions made in childhood are lasting.

Then the teacher started in with, "And now, pupils, I want to say a few words to you." I do not recollect what she said, except that she expressed her appreciation of the Visitor's encouragement, but greatly regretted that he had not given us an ideal definition of the word "boat."

That beat me and my new shoes; it woke the Visitor clear up, away up on his feet, and so suddenly that Frank and I snickered, and he looked

at me again for fifteen minutes, I felt; perhaps, it was really only a second, but I was subdued.

"Why, certainly, Miss Carrier, with the greatest of pleasure; it slipped my mind, when I got to talking of boyhood matters.

"Now, a boat is—of course, we must first know what the thing is; that you already know. There are lots of them just over the hill, on the Babcock pond. Now, get the thing clearly in mind, and then we are prepared to define it. A boat—such as you see on that pond every day—is—a boat is —such a boat as Frank has [that made me jump; it was a close shot, for Frank sat next to me]. I saw him going down there the other day, with another boy and three girls, a good boat-load; going out after some of those pond-lilies, I guess. But, I forgot; that boat like Frank's is—a boat—then there's another one, a beautiful boat, newly painted, with the name 'Lily' on it. I happened to think of that, speaking of pond-lilies. I don't know whether a girl by the name of Lily owns it, or whether some one of you roguish boys named it after your favorite girl."

We looked at the teacher; she smiled, and that told us that it was a joke, at which we might laugh, and we made the most of it. The boys all ya-

ha-ed, the girls tittered, and even the Visitor chuckled, and took off his glasses and wiped them in a deliberate way. Then he continued:

"Well, you're a happy lot, I see; youth is the time to be happy. I was just as happy as you are, at your age—and—and—well, I don't know but I've had some pretty good times since then." He looked at the Deacon, and we boys noticed that the Deacon's twinkle turned to a grin, and we young folks laughed again, but not so loud; we were not quite sure that we could laugh on the Deacon's grin. The teacher's dimple showed a little, then she looked solemn, and the Visitor proceeded:

"As I was saying, you must first see the thing—and yet, one thing isn't enough. Your definition is apt to be one-sided, if you don't take into consideration many specimens of the class. For example, there's Frank's boat. He keeps it for use; always has a good string of fish when he comes home; and I don't suppose he cares so much about the appearance of the boat as does the owner of that one beautifully painted, with the name 'Lily' on it. But you young folks know that these small boats are not all. A definition that would apply to them might not apply to other boats. There's the mass of logs that the boys

have tied together, and go out swimming on, they stand up and dive off into deep water from these. I know how it was when I was a boy; couldn't dive very well, either. We call that a raft, but, after all, it is a boat, of course differing from the others. Then, you know, there's Uncle Standish's big boat, plain, but serviceable; he uses it to take fertilizer, and tools, and crops across the pond, to what he calls his 'westside lot.' And, of course, now you're all thinking about the great ships with their white sails, and the swift steamers, with their powerful engines, that are also boats. So, you see, we have increased our knowledge of boats by broader experiences. Now, we come back home, to the path down through the huckleberry bushes, to the old oak, where so many boats of all kinds that you best know are tied to the shore.

"Now, for the definition. A boat is, such boats as all these—I saw one tied by a rope to a maple tree—but I am wandering [and, by the way, some of the young folks, in spite of the absence of any dimple, were venturing on the twinkle, and tittering a little]; yes, now let me get a definition all around that will be clear cut and apply to any of these boats. A boat is—a boat is—is—a—why,

any of you young people know what a boat is!"

Even the Visitor laughed at his own discomfiture, and the Deacon roared. Mrs. Brocker laughed till she wiped her eyes as if she had been crying, and the teacher, I did not know she could laugh like that, laughed as we young folks did. I do not believe she cared, then, whether she got her certificate for next year or not, she just laughed.

"But," seriously ask the teachers who are reading this chapter with a desire to find out what nature study is, "what has all this to do with defining nature study?"

Now, please, gentle reader, be really gentle and come with me, so that we may together survey the regions occupied by some of the principal workers in this department of our profession. I have been trying for several years, in my love of nature, to ascertain what is meant in pedagogics by this term nature study. I will admit that it has been somewhat of an embarrassing situation. But let us first get the thing in mind, and when we know what nature study is, we shall be ready to formulate a concise definition.

I take up a prominent manual by Professor

Jackman, that bears on its cover the words, "Nature Study." I open to the preface, and read as follows:

> In the preparation of this book, it has been the aim to furnish a guide for teachers in the common schools who wish their pupils to pursue an adequate and symmetrical course in Natural Science. Science teaching, for a few years past, has been gradually working itself downward from the colleges and high schools into those of lower grades, but, in most cases, the plans followed, while fairly well adapted to the demands of advanced pupils, have been poorly fitted to the needs of the beginners.

I look carefully, eagerly, through that preface, and find no reference to nature study, but considerable about "Zoology and botany, one lesson a week; physics, meteorology, astronomy, geography, and geology, one lesson each two weeks," and so on, with bracketing of schedules in which these and other sciences appear.

I look farther and find the words, "Nature Study for Common Schools," above the introductory chapter, the first sentence of which reads:

> It is of primary importance that the teacher who seeks to introduce elementary science into the common schools should make earnest study for the motive of doing such work, and, at the same time, formulate intelligent methods for conducting.

And so on. In that chapter and the next, and

the next, nothing but "elementary science." There are chapters on astronomy, meteorology, physics, but no nature study, except in the running titles at the top of the pages. What is the trouble with this excellent guide in elementary science? Has the author misnamed it, or does "elementary science" mean exactly the same as nature study?

I am forced to that belief, and having become grounded thus far in that faith, I take up the next book at hand, one by that master teacher and student of nature study, Professor L. H. Bailey, of Cornell, and read what shatters that conclusion. He says:

> What is Nature Study? It is seeing the thing which one looks at, and the drawing the proper conclusions from what one sees. *Nature Study is not the study of science*, as of botany, entomology, geology, and the like.

Diverse and antagonistic opinions of the same thing. Which of these excellent teachers is right?

I take up Wilson's "Nature Study in Elementary Schools," and find such expressions as:

> Can I teach this subject without scientific training? This course does not presuppose special training . . . only an earnest effort to become better acquainted with the familiar, yet, to most of us, unknown face of Nature.

And again :

> Perhaps nine out of ten teachers, if asked what is the advantage of Nature Study to the child, would say that it consists in the training of the observation through the senses.

This book refers to success with children in the field ; but again, a writer in POPULAR EDUCATOR concludes an extended article on "Field Work in Nature Study," with these startling words : "On the whole, we have found that more real good can come from taking Nature in to the pupils than from taking pupils out to Nature."

I look at Lange's "Handbook of Nature Study," and read the first paragraph of the introduction :

> The study of Nature with a view to understand the relations of plant and animal life to the welfare and happiness of man, needs no justification in this age of scientific agriculture and applied science.

I wonder what astronomy, grandest of all sciences, physics, chemistry, mineralogy, and geology have done, to be left out in the cold, and attention restricted to plant and animal life! And is "scientific agriculture" and applied science our sole justification for a knowledge of nature? But read the next sentence :

All our most progressive teachers agree that Elementary Science, or Nature Study, should have a place on the programme of every graded and ungraded school of the land.

Oh, the force of that little word, "or"! Have we two things, or have we one thing under two names?

Surely, we need not delve long amid the books and periodicals before we are ready to extend a sympathetic hand to Professor Surface, when he says:

However, were we forced to define the term, we should say that Nature Study is a subject in which the teaching is for the purpose of developing certain mental faculties, such as observation, comparison, reflection, reasoning, judgment, memory, intellect, and even the conscience, and in which the material used to secure this development consists of the objects and phenomena of Nature. Many persons think they have tritely defined and disposed of the matter in saying: "Nature Study is the study of Nature." If this be true, how does it differ from object lessons in which natural objects form the basis of work? If identical, why introduce the new synonyms and consequently confusing term? Or is it equivalent to elementary science? If so, why not call it science work, or elementary science? Or again, is it some branch of science or natural history, such as entomology, botany, or ornithology, as we must infer from the writings and teachings of some specialists, who have been recently devoting more or less time to something they call Nature Study?

Let us get outside of the circle of professional

instructors in nature study, and try to see ourselves as others see us.

John Burroughs' writings have been so read, memorized, and recited in the schoolroom, that he must surely have a good opinion of our nature-study work. Listen to the glowing terms in which he commends the labors of those who use his writings:

Not long since, in a high school in one of our large cities, I saw a class of boys and girls studying Nature after this cold-blooded and analytic fashion: They were fingering and dissecting some of the lower sea forms, and appeared to find it uninteresting business, as I am sure I should have done. If there was a country boy among them, I am sure the knowledge of Nature he had gathered on the farm was worth a hundred-fold for human purposes, or the larger purposes of science, all this biological chaff. Of the books upon Nature Study that are now issuing from the press, to meet this fancied want in the schools, very few of them, according to my thinking, are worth the paper they are printed upon. They are dead, dead, and neither excite curiosity nor stimulate observation.

John Burroughs has written this to me:

I should have said in my *Outlook* paper that I would, by all means teach the young people the elements of the great sciences—geology, astronomy, and chemistry. They are broadening and freeing, especially the two former. They enlarge the whole mental horizon. I would also inculcate the scientific habit of mind, accuracy of observation, care in reading conclusions, etc. Darwin is full of good lessons in this direction. But I would not encourage the young people

to think they can dissect their way into the mystery of Nature, or reach her through the laboratory.

While it is but common-sense opinion, and one almost universally admitted, that nature should be studied in her own domain, as well as in the laboratory, few nature-study or science teachers seem to admit this in a practical way.

Again says John Borroughs: "The purely educational value of nature-study is in its power to add to our capacity of appreciation, our love and enjoyment of all open-air objects."

So we have wandered, from nature study to nature study, and we find that, according to these authorities, it is science and it is not science; it is not to be studied in the fields and it is; it is to be pursued in the schoolroom and it is the biggest piece of nonsense that was ever seen in the schoolroom. We are progressing. Let us keep on, and we shall at some time get a clear idea, so as to be able to formulate a model definition.

Charles B. Scott, in his "Nature Study and the Child," thus attempts to define the subject:

It seems wise, at the very beginning, to determine just what we mean by elementary science, or Nature Study. This will prevent ambiguity and misunderstanding in later discussions. The terms "elementary science" and "Nature Study," are both widely used. Elementary science is, per-

haps, more exact, and, therefore, more scientific. Nature Study has a less formidable sound, and better expresses the spirit in which the work should be undertaken. It seems much the better term, at least, for the work in the first four or five years of the school course. The former term includes two ideas. First, it is elementary, as distinguished from advanced. In the aim or purpose of the work, in the material selected, in the methods pursued, it is elementary: planned for, and adapted to the needs and capacities of the pupils of elementary schools. In the second place, it is science, classified knowledge.

Here is offered the choice of another term for "elementary science." That surely is liberal, and nobody can find fault with the permission to use a term that has a "less formidable sound!"

Let us get a few more examples, and we shall then have the thing clearly in mind. Perhaps one of the best, surely the most "taking," concise, and euphonious, is that by Professor Clifton F. Hodge:

Nature Study is learning those things in Nature that are best worth knowing, to the end of doing those things that make life most worth the living.

This is excellent as a definition of his own idea, and that of many others. We will note, parenthetically, that what I have had in mind is not a matter of learning nature, but of loving her. It is not wholly a means to an end, it is an end in

itself. The child loves his parents for some end? No; the loving is an end in itself. But never mind that, now. Hodge gives us a commendable expression of his idea of nature study.

Even John Burroughs in his famous statement (previously quoted): "The purely educational value of Nature Study is in its power to add to our capacity of appreciation—our love and enjoyment of all open-air objects," fails to tell us what the thing is. He speaks of its resultant values. So he might have told us what the poetical, æsthetic, and other values are, and yet not have defined them. When I consider it seriously, I am really forced to ask, if anyone has ever defined it? Nature study, in the popular pedagogical sense, is science—no, it is not; nature study is a matter of the schoolroom—no, of outdoors; nature study is learning—no, that is natural science; but they are one and the same—no, they are not; nature study is—is—I mean such nature study as you see in the teachers' papers, in the books on the tables at teachers' institutes, such as you hear talked about; it is in the air, like evolution, or wireless telegraphy; nature study, in its ordinary, school sense, is—is—Why, any teacher knows what nature study is!

And, after all, perhaps these excellent nature-study writers and workers are in the same "boat," only they will not admit it. Perhaps the thing is not definable. It seems to me to be as intangible as electricity, or gravitation or life or love. We may tell much about it, what it will do, and will not do; we can go all about, and teach it here and there, and watch for results, but without knowing what it is. We are in as great a difficulty as was Walt Whitman in defining the purport of his own poems, "My final merits I refuse you."

John Burroughs, in "Whitman, a Study," attempts to clear up a difficulty that he thus formulates: "A great many readers, perhaps three-fourths of the readers of current poetry, and not a few of the writers thereof, cannot stand Whitman at all, or see any reason for his being." And in his great love for Whitman, two hundred and sixty-two pages are devoted to an attempt to clear up this difficulty. On the two hundred and sixty-third he thus summarizes his success: "After all I have written about Whitman, I feel, at times, that the main thing I wanted to say about him I have not said, cannot say; the best about him cannot be told about him anyway."

So it is with the spirit of nature study. Words

cannot convey the thing. You must see it, or it is not there. Light is useless to a blind man. So I say as to the popular pedagogical conception of nature study, anybody knows what it is. And it may well be added, that every "anybody's" is different from every other anybody's. I cannot even adequately convey in words my own idea of it. I can feel it, and see it, and live it, but I have difficulty in defining it. Here is an attempt to convey some suggestion of what I have in mind for ideal nature study:

Nature study is the examination of natural objects for your own gratification, to satisfy your own curiosity, to give you something to make your walks for exercise and fresh air more attractive; to free your mind of its work-a-day thoughts, and to supply their place with thoughts of God's work; to lead your attention from the ugliness and the evil that are in the world, to the beauty and goodness that are also in the world; to forget self and the troubles of life, and to sit in the sun, and look at the sky; to wonder if you really understand why it is blue, and why the clouds are white. It is nothing less nor more than taking an intelligent interest in the earth and its products. When you have taught the child to do this, you will have

taught nature study. And when you have taught nature study, you will have taught your pupil to be interested in the objects on the earth in his own vicinage. The result is worth its cost.

Or to express the same thing a little more concisely:

Nature study is the creating and the increasing of a loving acquaintance with nature. This shall begin and continue so informally in love, that, sooner or later, it shall welcome the accompaniment of formal knowledge. Both together, both head and heart, and both in earnest, shall increase our enjoyment of life, and our capacity to enjoy it.

In either case the definition is rather long and entirely superfluous. If you know what the thing is, you do not need the definition; if you do not know, or rather, if you do not feel, it is beyond the power of words to convey the thought.

CHAPTER II

"VAT FOR ISH DAT?"

According to one of the New York daily papers, the principal of a large grade-school in that city had a decidedly inquisitive visitor a few days ago.

He was sitting in his office intently poring over reports and excuses, when the janitor swung open the door and announced:

"A lady to see you, sir."

A German woman of ponderous size and waddling gait strode into the room. Both sleeves were rolled up to her elbows. In her right hand, by her side, she carried a huge lobster, just touching the floor, and swinging in accompaniment with her every pacing step. Her appearance indicated that it was indignation which had separated her from the wash-tub.

She swung the lobster over her head, and slapped it down on the table near the desk with a bang that made the absorbed mind of the principal leap from mental to physical matters.

"Vat ish dat?" shouted the belligerent visitor.

"Why-wh-y, that, madam, is a lobster, but——"

"How many leegz has it?"

"Strictly speaking there are ten, but only eight are——"

"How many claws has it?

"The first pair of the ten legs have large claws, the next pair have small claws, and the other two have only——"

"How many eyeez has it?"

"The lobster has two eyes——"

"Vat color is——?"

"But wait, madam; before I answer any more questions, please explain why——"

"Dat's vat I vant to know—*vat for ish dat* your teacher ask my Shonny all dese fool questions. I vork so hard at mine vash-tub all the day long, send my boy Shonny here to larn, and your teacher tell him all dat shtuff, and ax him all dese fool questions. *Vat for ish dat?*"

The reporter who described this interview in his daily paper saw only the humor of the situation. He did not record the principal's explanation, nor the further interrogations of the excited parent. For him it was enough to show the

ludicrousness of the situation. He may not have repeated the words of the conversation verbatim, as a court stenographer would have done, but it is evident to anyone interested in nature in the school-room, that he has portrayed a phase of parenthood in absolute fidelity to fact.

That this is truth, plain truth without an element of humor, can be vouched for by everyone who has had even a limited knowledge of what often results from the consideration of natural objects in the school-room. To use a current phrase, "This is a practical age." Parents form a jury before which the educator must prove the *cui bono*. He must show results worth the time consumed. The Why? stares him in the face; he must be ready for each parent who has a "Vat for ish dat?" And if the results are not worth while, there will follow a denunciation, as surely as the effect follows the cause. There is more than one Edward Bok, and more than one anonymous editor to voice the opinion of thousands of mothers, and denounce the overcrowding of the child's mind. There are voters to reject school officers if time consumed is worth more than results. There are superintendents like the one whom I met in Massachusetts,

to say, "We didn't have any room for that kind."

But editors, parents, voters, and school officers are not all who ask, "Vat for ish dat?"

Listen to Thoreau for a moment:

"We study botany and zoology and geology, lean and dry as they are, and it is rare that we get a new suggestion. It is ebb tide with the scientific reports, Professor ——— in the chair. How little I know of that arbor vitæ when I have heard only what science can tell me. It is but a word, it is not a tree of life."

This is as true of the dilute as of the condensed, of the kindergarten as of the university.

Regarding those sciences, Thoreau is asking, "Vat ish dat?"

Then we have our own John Burroughs, in an *Outlook* on educational affairs, asking the same question in another form, as he denounces worthless results and lack of vitality:

In our time, it seems to me, too much stress is laid upon the letter. We approach nature in an exact, calculating, tabulating, mercantile spirit. We seek to make an inventory of her storehouse. Our relations with her take on the air of business, not of love and friendship. The clerk of the fields and woods goes forth with his block of printed tablets upon which, and under various heads, he puts down what he sees, and I suppose foots it all up and gets at the

exact sum of the knowledge when he gets back home. He is so intent upon the bare fact that he does not see the spirit or meaning of the whole. He does not see the bird, he sees an ornithological specimen ; he does not see the wild flower, he sees a new acquisition to his herbarium ; in the bird's nest he sees only another prize for his collection. Of that sympathetic and emotional intercourse with nature which soothes and enriches the soul, he experiences little or none.

Professor Hodge had evidently heard of or met the German washerwoman, or other like minded folk with a "Vat for ish dat?" for he writes in "Nature Study and Life":

But, the teacher says, the parents make all sorts of objections to nature study, call it a "fad," "nonsense," complain of "waste of time on new-fangled notions," say that "they never had to learn such stuff." These objections of the home are for the most part right as to what often goes by the name of nature study, and nothing could be more helpful for development of ideal courses adapted to local conditions, than to invite their freest possible expression. If we cannot find a nature study worth while, a nature study so full of human good that it will meet and overcome all such objections, then we should devote the time to other subjects. But from several years' experience, the writer is confident that all reasonable objections can be met, and that we can find a nature study so good that this attitude of parents can be completely reversed and their interest and enthusiasm so thoroughly aroused that they will say : "We had no chance to learn these things, but we wish our children might be given the opportunity and teach us."

The trouble is, as has been so often reiterated, that few teachers swing themselves around to

the child's standpoint. In some studies, the teacher must be a teacher, above the child, telling the child. To overcome the onesidedness of a school limited to mere instruction, nature study has been introduced as the most available field in which to let the child do the telling. But, simple as this is, it seems an exceedingly difficult thing for some teachers to understand. Hence the opposition which it meets in some communities, and the amusing paragraphs so frequently seen in print. One of these (shall we call them sad but literal statements of certain real conditions?) is the following from the *Youth's Companion*. It is a fair example:

A small girl who has just begun to attend school brought home a pumpkin seed and told her mother that the teacher said that, although the seed was white, the pumpkin would be yellow.

"And what will the color of the vines be?" asked the mother.

The little girl replied that the teacher had not taught her that.

"But," said her mother, "you know, dear, for we have pumpkin vines in our garden."

"Of course I do, but we ain't expected to know anything until we are taught."

It is the parents of those children who are the victims of such nature-study instruction that will

inquire, with frowning brow and threatening tone, "Vat for ish dat?"

The reverse of this lobster-pumpkin teaching is the true doctrine.

C. B. Scott, in his "Nature Study and the Child" occupies the correct standpoint.

> More than is the case with most other studies, probably, science, or nature study, deals with the individual child, and aims to develop each child as an individual. It places the material in the hands of each child, and expects him to see and think and tell for himself. Nature is many-sided; and when pupils observe for themselves, each will have a different point of view, will see a different side. The teacher will thereby be helped to realize the difficulty, the impossibility, and, finally, the viciousness, of teaching *en masse*, of teaching classes rather than individuals, and will recognize, respect, and at length encourage and develop, the individuality and self-reliance of the pupil. . . .
>
> We are more and more endeavoring in our schools, from university to kindergarten, to have our students get more than facts; we are striving to develop their intellectual powers—of seeing or apprehending for themselves, of thinking or combining ideas in their relations, of expressing or conveying these ideas to others, and of doing or making their ideas active or effective.

And it may well be added that this original seeing and telling by the child are not to be confined to nature study. What a glorious thing it would be if education could take the place of instruction, if the nature-study point of view could

be added to all studies. Elbert Howard says, "The kindergarten is the best school ever established for educating—parents." And I add, for educating teachers.

Nature pedagogy is the true pedagogy; let the spirit of it permeate and give vitality to every feature of the schoolroom so strongly, that it will accompany the child through his life.

Dr. J. E. Taylor, late editor of "Science Gossip," and a writer of scientific books, says:

> Is there anything more delightful than the fatigue of an afternoon's long ramble after objects one loves? You are not tired of them but with them. It is a delicious fatigue. Subsequent years of trouble cannot obliterate the charmed impressions. They are the sunniest spots in one's memory. Their recollections come, like angels' visits, to unconsciously relieve us in after years of many a sad trouble and trial. They should be laid up in store when you are young, so that they can be drawn upon when you are old. Then the sunshine of youth is stored to gild the troubled days of matured manhood and the darker shadows of old age.

That is "vat it ish for." That is what we teachers shall not need to explain, if we act so that the question need not be asked. We shall arouse the child, and make that waking so noticeable by the parent that he will fail to observe the lobster.

We would not make the child's mind a dump-

ing ground for fad-zeal facts, nor a target for volleys fired according to schedule. We would put him and his mind into an atmosphere of things good, true, and beautiful. Even his uncultured parents will appreciate that and say, "Dat ish goot. Mine Shonny hab ein goot teacher."

And of this environment, this atmosphere of out-door life, there come words of commendation from cultured writers and thinkers. Take a prominent representative. Hear the words of Hamilton Wright Mabie:

> There, are, however, habits and qualities which are characteristic of those who succeed in establishing this relationship with nature.
>
> They are, in the first place, very constantly in the presence and company of Nature. They not only seize, they make opportunities for getting into the woods, for loitering in the fields, for exploring the streams, for walking across the country. . . .
>
> These persons form the habit, in the second place, of leaving their cares, work, interests, and self-consciousness behind them when they go out under the clear sky, along the country road, or into deep woods. They go with an open mind; they are alert to observe, but they are above all things else ready to receive whatever truth, power, or spirit Nature has to impart.

It is worth while to have all children in such intimate relations with Mother Nature. Her

Dulce Domum will then be *dulce domum* not only in the desire of the teacher, who has the child's welfare at heart, but *dulce domum* in fact.

Perhaps your son cannot be rich in money or gee-gaws, but he can be wealthy in his ownership of the world. As Bunyan said, "I have known many laboring men that have got good estates in this valley," and Bradford Torrey tells us, that, "His private opinion is that the world belongs to those who enjoy it; and taking this view of the matter he cannot help thinking that some of his more prosperous neighbors would do well in legal phrase, to perfect their titles. He would gladly be of service to them in this regard."

I hope that all teachers may be of service to our boys and girls, in this regard. Rightly viewed that "ish vat it ish for." Many persons "want the earth;" so do we, but we want it with no "fence around it." Let old and young break through the palings, and take possession of their birthright, with all its multitudinous resources of enjoyment, and be at home there.

Thoreau thought that the holder of the deed was not really the best owner:

> How when a man purchases a thing, he is determined to get and get hold of it, using how many expletives and how

long a string of synonymous or similar terms signifying possession in the legal process. What's mine's my own. An old deed of a small piece of swamp land, which I have lately surveyed at the risk of being mired past recovery, says that "the said Spaulding, his heirs and assigns, shall and may from this (?) time, and at all times forever hereafter, by force and virtue of these presents, lawfully, peaceably, and quietly have, hold, use, occupy, possess, and enjoy the said swamp," etc.

I like that kind of socialism. I hope the teacher will help your son to get it. We believe in universal ownership here. We want to be rich and noble. Our philosopher Emerson tells us how to do it, and we are trying to tell your boys.

He who knows what sweets and virtues are in the ground, the waters, the plants, the heavens, and how to come at these enchantments is the rich and royal man.

I think you will agree with me that it is worth while for your son to be rich and royal. If we are not on the right road to riches and royalty with that lobster, we will get something else, and another teacher with it.

"Nature is loved by what is best in us," further says Emerson. We want to bring out the best in your boy; we believe that exercise strengthens and develops. We are going to strengthen and develop that "best" by the persistent exercise of

the nature love, which we sometimes call nature study.

Do not be in haste to go; sit still for a moment, your son is worth more than those clothes in the tub. Let me explain further. You want him to do great deeds, I suppose? Did you ever hear of Ruskin? He was a wise man, who got below the surface of things. He said:

> The greatest thing a human soul ever does in this world is to *see* something, and tell what it *saw* in a plain way. Hundreds of people can talk for one who can think, but thousands can think for one who can see. To see clearly is poetry, prophecy, and religion, all in one.

We want to develop your boy's originality, not to pack his head with useless facts. We want to help him to see things and to tell what he sees. To see them in their right relations; to wake up and realize that life is worth living, and worth living, too, in its fullest capacity, and in the best manner. We want to put him under the influence of Mother Nature, because we can find no other power of development so beneficent.

Your boy may never be rich or great or influential, except in the way that I have indicated. Let him have that at lea—no, at most. He may never be a famous writer, nor a poet, but he may

live a famous and poetical life, about which perhaps he only will ever know, and while he may never be able to express himself with Wordsworth's skill, yet he may live his poetry in all the fullness with which Wordsworth lived it as a boy:

> There was a Boy ; ye knew him well, ye Cliffs
> And islands of Winander !—many a time,
> At evening, when the earliest stars began
> To move along the edges of the hills,
> Rising or setting, would he stand alone,
> Beneath the trees, or by the glimmering lake ;
> And then, with fingers interwoven, both hands
> Pressed closely palm to palm and to his mouth
> Uplifted, he, as through an instrument,
> Blew mimic hootings to the silent owls,
> That they might answer him.—And they would shout
> Across the watery vale, and shout again,
> Responsive to his call—with quivering peals,
> And long halloos, and screams, and echoes wild
> Of mirth and jocund din ! And, when it chanced
> That pauses of deep silence mocked his skill,
> Then, sometimes, in that silence, while he hung
> Listening, a gentle shock of mild surprise
> Has carried far into his heart the voice
> Of mountain torrents ; or the visible scene
> Would enter unawares into his mind,
> With all its solemn imagery, its rocks,
> Its woods, and that uncertain heaven, received
> Into the bosom of the steady lake.

Many young folks do live in this way, until they are given too much lobster!

The Point of View.

The prime necessity for good nature-study "teaching" is the point of view, what the thing is from your own appreciation of it, and then the purpose in transferring that appreciation to each child. I say, "your own appreciation," because we get, in this world, what we prepare for, and what we give. If you want to develop the individuality and love of the child, first develop and make sure of your own individuality and love, and then give generously to the child. Establish a comradeship with every pupil.

I fancy that some one may object to the reply which the principal made to the German washerwoman, when he tried to explain the purposes of nature study, and that some one may claim that he expected too much, because the woman's son may not have the ability to be a Wordsworth boy. And if you do say that, it is right there that you make a mistake. He loves something exactly as Wordsworth loved. It probably is not "ye cliffs and islands of Winander." But it is something else with an equal love. Your duty is to find out that love. If it is worthy, then develop it. If it is not worthy, then guide it to

something that is. Therein is your mission as a nature-study teacher, to find out, develop, guide, a love for natural objects. Few can write as Wordsworth wrote of his boyhood. But where is the boy that cannot, that does not live it in all the fullness of spirit that Wordsworth lived it as a boy. Few can write good poetry, but every one can and does live it to a greater or lesser extent. Every man, woman, and child is a poet-naturalist. The child's play, the woman's hopes, the man's ambitions, the philosopher's hypotheses are all poetry, though we may call them fancies or the building of air-castles. They are all true poetry, the charm that makes life worth living, the illumination of life by the light that was never on sea or land.

And every one is a naturalist. No one is so senseless as not to appreciate sunshine, flowing water, the ocean, trees, flowers, something. Find out that poetry, that something, then develop it. It is a high calling that comes to you, nature-study teacher. It is for you to develop your poet-naturalists, and you are responsible for just as many as there are pupils in your school.

"Nature Study trains us to keep our eyes open to the living things about us and to an earnest inquiry into the meaning of what we see."—A. C. BOYDEN.

"It can never be too strongly impressed upon a mind anxious for the acquisition of knowledge, that the commonest things by which we are surrounded are deserving of minute and careful attention."—RENNIE.

I wrote a sober, scientific account of all its parts, without a spark of life in it—but I threw it away. I know now that there is something better than the botany of the Horse Chestnut tree, and that is the poetry of it. . . . There is poetry and beauty all around us in every common thing, and we, who have had health and eyes, have not seen it. Let us wake up and look about us and get the most out of life every day that we live! Happiest are they who can still look out upon Nature with the eyes of childhood! . . . The first thing is to open the heart. The next thing is to open the eyes.

JULIA ELLEN ROGERS, *in* "*Among Green Trees.*"

"As a rule, children observe well; but a false method of teaching especially that which reduces all school work to a study of books, often destroys this natural tendency. When we reflect what an important factor in mental growth the habit of close and accurate observation is, we can but deplore that so much of our school work tends to diminish rather than to increase this power. Nature study if so taught as to awaken interest, rather than fatigue the pupil, can be made an important aid in the development of this power."—Education through Nature Study, JOHN P. MUNSON, Ph. D.

CHAPTER III

WINNING LOVE FOR NATURE STUDY

"Nature study is never a task, but a tonic. It recreates."
DR. C. C. ABBOTT.

There often comes to my mind a paradoxical story heard in my boyhood days, of an Irishman (for the Irishman is proverbially and everywhere a wit), who at a country store was endeavoring to secure a proper-sized pair of cowhide boots.

He maintained that No. 10 was the required size, but the storekeeper insisted that No. 14 would be a better fit. It seemed evident that the merchant was right, for Pat could not draw on the No. 10's. Still, as he tugged at the straps he declared that 10 was the number, and that his inability to get them on was due only to the stiffness of the leather. Suddenly his flushed and perspiring face lit up with a mingling of smiles and inspiration. The problem was solved. Yet there was a shade of disgust apparent because his bright idea had not come sooner, to save him some hard and futile work.

"Shure," he said, "and why didn't I think of it before? All the trouble is I've got to wear thim boots a few days to limber thim up, an' thin they'll go on aisy."

My interest in the story, and hence my vivid recollection, is not due so much to the absurdity of the situation, as to my sympathy with Pat! The remembrance of the amusing phases of the tale are mingled with my attempt to reconcile with boyish logic, the two facts, that, while Pat in the main was wholly wrong, yet, from a certain standpoint, he was more than half right.

The Irishman's logic has a host of sympathizers among those who attempt to do certain things. As the architect's plans precede the building, so in most cases, the object must be completed in spirit, before it is even begun in reality. This is emphatically true in winning love for the study of nature; the germ must exist before the love can be developed. Something can seldom be made out of nothing.

As Wordsworth says of his poet,—

> "You must love him, ere to you
> He will seem worthy of your love."

There must be an inherent love for nature before

nature will seem to be lovable. We may talk about the lovableness of nature, but we must inspire an interest, and arouse a curiosity, before we exhibit nature's wonders and beauties. At first thought and in the first attempt, this would not seem to be the correct method. The non-lover might reasonably argue, that if nature is so instructive and so lovable, then the best method must be to collate her interesting and winning points, and by their graceful and attractive presentation, win the affection that we are seeking. That process applied where there is no inherent and dormant love, may obtain a transient result, but it will be illusive and hypocritical. Do not mistake open-mouthed wonder and open-eyed exclamations of surprise for love of nature. Such dime-museum interest is worse than none. It is repellant and ludicrous. How well Mark Twain has presented this method of viewing interesting things. You will recall his experience with the European guide:

"All their lives long, they are employed in showing strange things and listening to bursts of admiration. It is human nature to take delight in exciting admiration.

"After we discovered this, we never went into ecstasies any more, we never admired anything,

we never showed any but impassible faces and stupid indifference, in the presence of the sublimest wonders a guide has to display. We found their weak point. We have made good use of it ever since.

"'Come wis me, gentlemen! come! I show you ze letter writing Christopher Colombo! write it himself! write it with his own hand! come!'

"He took us to the municipal palace. After much impressive fumbling of keys and opening of lock, the stained and aged document was spread before us. The guide's eyes sparkled. He danced about us and tapped the parchment with his finger:

"'What I tell you, gentlemen! Is it not so? See! Handwriting Christopher Colombo! Write it himself!'

"We looked indifferent, unconcerned. The doctor examined the document very deliberately, during a painful pause. Then he said, without any show of interest: 'Ah, Ferguson, what did you say was the name of the party who wrote this?'

"'Christopher Colombo! ze great Christopher Colombo!'

"Another deliberate examination.

"'Ah, did he write it himself, or—or how?'

"'He write it himself! Christopher Colombo! He's own handwriting; write it by himself.'

"Then the doctor laid down the document and said:

"'Why, I have seen boys in America only fourteen years old that could write better than that.'

"'But zis is ze great Christo——'"

"'I don't care who it is! It's the worst writing I ever saw. Now you mustn't think you can impose on us because we are strangers. We are not fools by a good deal. If you have got any specimens of penmanship of real merit, trot them out! If you haven't drive on!' We drove on."

You will recall the conversation (with a touch of sympathy perhaps for the guide), as he shows a bust of Columbus and an Egyptian mummy.

As the humorist was apparently impressed by his frantic efforts to present his wonders so as to win exclamations of admiration, and to arouse the traveler's interest in those antiquarian affairs, so in reality many a boy or girl is impressed, and often likewise those of older growth, but the impression vanishes with the Oh, and Ah, and Oh my, which the efforts excite.

Therein partly lies the explanation of the quizzical, semi-amused sentiment so commonly felt for the naturalist, by his ignorant aquaintances. For the learned and loving naturalist to attempt to win for nature the love of such unimpressionable persons, is like an attempt to talk with the inhabitants of another planet, or as some one has humorously expressed the same principle, like a young man trying to throw kisses at a pretty girl across a dark room.

It is as paradoxical with us as it was with Pat, if we try to win a love for the study of nature where it does not originally exist. The result of that will always be failure, and a waste of nerve force. The adage, "You can never make a silk purse out of a sow's ear," is ugly. Yet, it is beautiful because it is true. Watch an enthusiastic herpetologist, entomologist, or botanist, at his studies, and hear him tell of their delights, and observe how much love for his pursuits he will arouse where there is no dormant love to be excited. "Poor man, you may be all right in the main, but there is a 'brick' loose somewhere." Is not that the poorly concealed opinion? Such futile efforts are made in many a school-room, partly from a lack of true understanding of the

situation, and partly, perhaps largely, from very force of circumstances. *Instruction* may be imparted, but the real educational value to be had in learning of some detail of nature, is about as valuable as to learn the population of some little village a thousand miles distant. Neither fact will be the child's own. The instruction has been given, but the value of the educational property is not appreciated and is lost.

There may be a large love of nature, yet wholly unknown because dormant. To suggest a method for the winning of this love is the purpose of this chapter. A love for nature must be won and increased by a corresponding love on the part of the teacher, expressed freely and practiced fully. As Barnet Phillips in the preface to "Eye Spy" has it:

"What I want to discover is the precise time, in the lives of certain boys and girls, when the steel first struck the flint, the spark flew, and out streamed that jet of fire which never afterwards was extinguished."

William Hamilton Gibson tells us how this was in his boyhood days:

"I was very young and playing in the woods. I tossed over the fallen leaves, when I came across

a chrysalis. There was nothing remarkable in that, for I knew what it was. But wonderful to relate, providentially I deem it—as I held the object in my hand a butterfly slowly emerged, then fluttered in my fingers. I was more than pleased with its beauty. I do not know whether I was or was not a youngster with an imagination, but suddenly the spiritual view of a new or of another life struck me. I saw in this jewel born from an unadorned casket some inkling of immortality. Yes, that butterfly breaking from its chrysalis in my hand shaped my future career."

As the child never truly makes such instruction his own if it does not find response in his heart, so pitiable as it is, many older "children in the kindergarten of God" never utilize their most valuable inheritance, because it does not reach the heart.

The deed to such possession of the world is love of nature, the love that you must win by love and by the telling of it. You must have a love for nature before you can win it for her from others. Then "both head *and* heart and both in earnest." You must wear the boots for the child first; you must get him into your world and to understand the language of nature, for indeed "Nature speaks a varied language." She may have her surprises, but

it is to be doubted whether she has loveliness and beauty, except as reflected from the human heart. The pathway to this is not through the surprises, but through us, and our heartfelt appreciation. More than that, it is ourselves. Or, as Bryant tells us,

> "Yet these sweet sounds of the early season,
> And these fair sights of its sunny days,
> Are only sweet as we fondly listen,
> And only fair as we fondly gaze.
>
> There is no glory in star or blossom,
> Till looked upon by a loving eye;
> There is no fragrance in April breezes
> Till breathed with joy as they wander by."

You must wear the boots before you can put them on. The youthful David felt this, for, of the new armor which Saul gave him, he said, "I cannot go with these for I have not proved them. And David put them off." Practically, he could not wear them until he had previously worn them.

There must be the stock before the graft; the seed before the plant can develop. Therefore, talk about the attractions of nature and of her beauties, especially of the beauties. It was the Christ himself that exclaimed at the beauty of the lilies of Palestine. It is the Eternal God himself that looked at his completed work and

said, "It is good." And he put the first man in a garden, with the perfect beauty of nature surrounding and embracing him.

Show the child the beauty surrounding him, provided you are sufficiently skillful and sufficiently in love with that beauty to find it. But it is everywhere. You can teach the pupil to appreciate it, although he may have no inherent love for so called Natural History. The greatest artists are rarely naturalists. The sculptor studies human anatomy, not because he wants to be an anatomist, but to make his work more nearly perfect. Expatiate to your pupils on the beauty of nature. Then show them some, and keep on showing them if you want to do good work. We all crave the beautiful. Even the paper on our wall is now what we call artistic; even the iron register through which the demon in the cellar dashes his hot blasts, are made graceful and alluring to the eye. We all crave beauty, when we have been taught that there is such a thing outside of heaven.

Life, progress, and growth are always interesting. We all like to watch a train leave the station, men digging a cellar, carpenters building a house, or a plant or an animal in its development. This

fact can be utilized, and is successfully utilized in the school-room and in out-of-door work in sense training. Notice the changes in foliage color in a landscape; recognize the changes that take place in the prevailing hue of flowers as season follows season, from the white of the earliest to the dark purple of the autumn Asters. Seeing the actual changes awakens interest, and when awakened, it will branch out in other directions. Then your battle is won.

A healthy child is an animated interrogation point. When he learns that many of his questions can be answered by keeping his sense alert, he will find his appetite in this direction wonderfully and joyously growing. He will need help and guidance. But the desire and determination to dig a thing out for himself, is of inestimable value for increasing his happiness, and should never be repressed.

Nature study in its present pedagogical meaning, is not systematic study of nature, for that is science. Nature study is emotional, as science is intellectual. Anna Botsford Comstock has well expressed this opinion.

"When the idea of nature study first dawned in the educational world, it was inevitably con-

fused with the sciences on which it is based. To-day nature study and science, while they may deal with the same objects, view them from opposite standpoints. Nature study is not synthetic; it takes for its central thought the child, and for its field work the child's natural environment."

But some one may still insist, if nature is so interesting and lovable, it is sufficient to allow her interests and attractions to speak for themselves. Yes, but they never will. They need an interpreter. When the young man goes a-wooing, does he constantly talk only of his own excellences and possessions? or when a man is seeking his wife's happiness, does he depend on his intention to furnish her with a good home and plenty of money? Does not something come in ahead of temporal considerations. The expression of love, is it not?

Yet mere oral expression is not enough. A child can detect a hypocrite quicker than you can detect a misspelled word or a grammatical error. He can do it unerringly, and he will. If your pupil brands you as a fraud, your fate is sealed. You can never teach him anything good. Do not talk to him about the lovableness of nature

if you have none of the genuine article in your own heart; heart, not head.

We who would teach and inspire the young folks, must learn our own lesson before we try to instruct them. Otherwise the child will find our teaching as interesting and impressive as Frank Stockton's bookseller found the "Logarithm of the Diapason."

Let me quote again from John Burroughs:

"A great many people admire nature; they write admiring things about her; they apostrophize her beauties; they describe minutely pretty scenes here and there; they climb mountains to see the sun set, or the sun rise, or make long journeys to find waterfalls, but nature's real lover listens to their enthusiasm with coolness and indifference. Nature is not to be praised or patronized. You cannot go to her and describe her; she must speak through your heart. The woods and fields must melt into your mind, dissolved by your love of them.

"The passion for nature is by no means a mere curiosity about her, or an itching to portray certain of her features; it lies deeper and is probably a form of, or closely related to, our religious instincts."

And from Bradford Torrey:

"I hope I am not lacking in a wholesome disrespect for sentimentality and affectation; for artificial ecstasies over sunsets and landscapes, birds, and flowers; the fashionable cant of nature worship, which is enough to seal a true worshiper's lips under a vow of everlasting silence. But such repugnances belong to the library and the parlor, and are left behind when a man goes abroad, either by himself or in any other really good company. For my own part the first lisp of a chickadee out of a wayside thicket disperses with a breath all such unhappy and unhallowed recollections. Here is a voice sincere and the response is instantaneous and irresistible."

CHAPTER IV

CORRELATING NATURE STUDY

"Oh, yes, we know all about correlation; we have had full instructions, read topical outlines and schedules in our teachers' journals; had it reiterated to us at the Institutes; seen it advocated in the schedules of nature study for each month, and, therefore we know all about it. Of course we correlate nature study. We correlate it with drawing, language lessons, writing, and even with arithmetic and geography, so we are all right on that, and we need no further instruction."

If you really have correlated nature study in all those ways, and insisted upon it in all cases, you have done exactly what you should not have done. You have shaken water and oil together and made a compound, good neither for lubrication nor for quenching thirst. Or, to use another simile, you have flavored a dose of castor oil with wintergreen, and made a mess. You may have helped the oil, but you have made it mighty bad for the wintergreen!

Have you really been using nature study,

that is, original investigation on the part of the child? Have you not simply used a few natural objects in the various kinds of work that you have mentioned? If so, and, I really hope it is so, you are after all not guilty of spoiling the wintergreen.

Not long ago I attended, in a high school assembly-room, an exhibition of the work of the grade schools in the town. As I entered the hall, a supervising teacher came forward and said, "I am glad you came; I know you will be interested in everything, but I want especially to show you what we have done in nature study. I know you are interested in 'such things.'"

Indeed, I was interested and proud too, of the good results attained by the schools, for the exhibition showed lines of work that were truly remarkable.

"There," said my fair guide, as we approached a particularly attractive table, "I know you'll like this. Isn't that beautiful? How well our children do it! Isn't it surprising? Don't you think they've done well?"

Truly it was a beautiful exhibit; the children had done well. I said so frankly, and expressed surprise that so excellent work should have been

accomplished by children who were so young, as shown by their ages marked on the specimens.

"Aren't you glad that our schools are doing so good nature work?" exclaimed the enthusiastic teacher.

"Nature work! Where is it?"

I was not diplomatic, I know, with such an interlocutor and after so cordial a greeting. The words slipped out without a thought.

"Here, here; what are you thinking about? This nature work; isn't it beautiful?"

"Yes, it is beautiful drawing, neat writing, correct capitalization and punctuation," I hesitatingly equivocated, as I picked up a prose paraphrase of Bryant's "Fringed Gentian," decorated with "original" drawings. There was at the end a little angel with wings, and an anchor with a chain gracefully twined around it.

"Hope blossoming within my heart,
May look to heaven as I depart."

Then came Emerson's beautiful fable of "The Mountain and the Squirrel."

"The mountain and the squirrel
Had a quarrel;
And the former called the latter "Little Prig;"
Bun replied
You are doubtless very big."

I read no further, but I am sure the mountain backed out of the fight, if I may judge from the squirrel's attitude and expression. It was artistic, and certainly artistically realistic from the child's standpoint.

Then appeared "Seaside and Wayside" stories retold with drawings, almost as good as the originals.

Perhaps the most attractive was the work in water-color. A bouquet of roses painted by a child eight years of age was indeed remarkable, and so I went over the drawings of daisies, maple keys, wild geraniums, dogs, and horses. I felt a tinge of disappointment when I saw that the flowers had been drawn in the winter term, some with the aid of outlines on the sheets, and had been colored *ad libitum*, or by the direction of the teacher.

Yet it was all good work in drawing and language, most of it having been made from outlines and books, while only a few samples had been made directly from nature.

The trouble was that I was talking to the nature supervisor and not to the teacher of drawing or of language, and my questioner was persistent. She

repeated, "Don't you think this nature work is good?"

And so I was forced to say, as I do to you, that it seems to me that the mere drawing of natural objects and writing about them, even if from the objects themselves is not necessarily nature study. A talent for original seeing, a love of natural objects may be stunted by the requirements of drawing and writing. The wintergreen seemed to be pretty nearly all castor oil, judging by the taste. You can correlate nature study in this manner till there is no nature study left.

Professor Hodge in his "Nature Study and Life" (I like especially that word *life* in the title) tells us regarding the experience of the children in rearing plants:

"No skilled gardener can even tell, much less write down, a hundredth part of what he knows about plants. . . . It was thought at first that the children might be induced to keep diaries or records of their plants, giving just what they did and just how fast the plants grew; but it was found that their writings were of little value, and *were even thought to act as a chill to the spontaneous interests of some of the children. Some children have a passion to write, while in others the very*

thought of writing seems to benumb every impulse." The author's italics are expressive.

But if you must correlate nature study and language exercises—and there are some teachers who will persist in doing it—never lose sight of the original-seeing nature study.

Then, again, be sure that you know which is nature study, and which is the drawing and language, and just wherein is the correlation.

Not long ago I had occasion to examine several hundred letters from children engaged in a contest of nature-study writing and drawing. Please note that it was nature-study writing and drawing, not a contest on writing and drawing nature study.

Among the many letters was a particularly attractive package of eighty, all from one school. " Here is the prize," I thought, as I cut the pink string and opened the neat foldings of firm manila and delicate tissue paper within. The letters were written on only one side of the sheet and not folded which alone was enough to make them attractive to an editor. What beautiful vertical writing (not that I am especially an advocate of that system) but beautiful because it was so perfectly legible. It was a pleasure to read. And the capitalization and punctuation? All perfect.

Then, too, what beautiful drawings. I envied the child whose letter I first picked up. So neat and pretty. After my hard work over nearly a thousand others, this instalment was indeed refreshing. But when I had thus enjoyed about a half dozen, there began to creep over me a feeling that I had somewhere previously read that last one, and not so long ago, either. Then I studied them with keener interest and with growing amazement. How could so many children have ascertained certain facts with a clearness so uniform, and have described them in expressions so similar? It was bewildering. Eighty of them, and all cut on the same bias. But that bias was really bright and fresh. I could not gainsay that.

After I had read about two dozen, my mind recalled a visit to a factory in Waterbury, where I saw a coil of wire fed into a machine and reappear as a stream of glittering pins that were rolled around in a "hopper," and shot out of a spout neatly arranged in rows on paper. Some enthusiastic teacher had correlated a coil of a "nature-study" story into a school machine, and the hopper had evolved attractive language-pins beautifully arranged on eighty papers, and then, alas and alack! she sent them to me. The thing I

wanted was not there. In sadness I laid them aside.

Next I picked up an unattractive letter written on the leaves of a pocket note-book. The drawing that accompanied it was crude and the paper was soiled by finger marks. With difficulty I read it, but was fascinated as I deciphered the story of a boy's seaside investigation of the fiddler crab. He wanted to know how they lived underground; what they did; what food they ate; what kind of quarters they occupied. He made inquiries of the fishermen. No one knew. He said, "I'll find out if it takes a week." He borrowed pick, shovel, and crowbar. He went to work and he found out. Then he wrote the story, as he sat beside the hole that he had dug after several hours' hard work. He made the drawing after careful watching of the living object. He wrote the article on the field of battle, where the weapon was a spade, the enemy a crab. I was sorry that I had not a basketful of prizes to give that boy, because he wrote his letter for the love of it, and not for a reward, of which he knew nothing.

The story of a little girl's watching the sexton beetles burying a dead snake "hour after hour, with her little rocking-chair and parasol, in the

broiling hot sun," as her mother expressed it in a letter written without the child's knowledge, showed nearly as much determination to find out things, and the description was good enough for second prize. The drawing like a huge letter S was explained to be "the snake;" two little rings like miniature pennies, were explained to be "the beetles." It was charming.

I found some others nearly as good, which lost high rating by only a slight deficiency of the right spirit; such letters were a prize in themselves, but I regret that in numbers they were small. The greater part showed too much correlation of language-work and drawing. The nature study, if indeed there had been any, had been buried out of sight. Yet many accompanying letters from parents and teachers showed that the importance of nature study was appreciated.

There is danger of correlating nature study until it is annihilated.

There is danger too of thinking that you have some nature study and some drawing when you really have none.

"But do you mean to say, that we shall not correlate nature study with language-work and drawing?"

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Yes and no. It all depends upon where you stand and what you do and how you do it. You may find natural objects useful in your language teaching and in your drawing lessons, but do not let it end there. Have some nature study sometimes uppermost in your mind, with or without language lessons, according to circumstances and the preferences of the pupils. "These ought ye to have done, and not to leave the other undone."

All these things are from the negative, that is, from the prohibitive or cautioning point of view. The positive also exists, but with it there is no danger of correlating too much.

Incidentally and to such limited extent as may be found necessary, there is manual training. Instead of having the pupils in that department wholly occupied in making patent boot-jacks, wooden nutmegs, or in engraving Chinese hieroglyphics on blocks, good as all these things may be from an artistic point of view, let some of the most active and practical boys make things to be used in nature study. There is the doing before the seeing, and spontaneous activity and original observation are the prime essentials of true nature study.

For plant life we want the germinating case, the

boxes for indoor and outdoor gardens, the miniature hot-house with roof of window-frame and shingles of glass, the fernery, and plant presses.

For insects, there are the net, the breeding-cages in great variety of designs, the tanks for aquatic insects, amphibia, and fish. There are the vivaria for the turtles or snakes. And speaking of snakes reminds me that the same vivaria covered with wire netting may have the bottom turfed over and used as a cage, in which to watch grasshoppers shed their coats from time to time.

As we go higher in animal life, there is even greater scope for the manual training correlation, and that is in the development of the artistic talent. What scope is here given for the designing and building of bird-houses! What a variety of grades and styles of workmanship are possible! For our four-footed animals we need a cage, one box-like section lined with sheet-tin, the other an open framework on which wire netting is neatly tacked. Let the boys make these.

Would you develop originality? Then increase ingenuity, quicken powers of observation, correlate manual training with nature-study interests and see how the whole child-life wakes up. You wake

him up to one thing and he is awake to all. "I take a deeper interest in my geometry and Latin since I became interested in nature study. I'm going to be somebody," is an extract from a letter from a high-school boy. And then he goes on to tell of his "air castles," about being a scientist and making some great discovery. That boy woke up. He came to himself, and the life developed by nature study will be useful and efficient in any occupation.

Nature study is a valuable correlation in teaching true democracy, the American idea. There is no aristocracy or oligarchy in nature. Even the queen of the communal Hymenoptera is not an aristocrat, but the most prodigious worker of them all. She is even "elected" from among the plebeian worker-eggs, and held to her position by the most perfect democracy in the world, an absolutely universal approbation.

The naturalist who sees things in their true relation sees no high nor low, but universal co-operation and mutual interdependence. The scarlet tanager is attractive, but it is easy to show the young folks that the earthworm has a mission quite as important. Nature study impresses one with respect for high and low, large and small,

and binds all together in universal sympathy and brotherhood.

> "He prayeth best who loveth best
> All things both great and small;
> For the dear God who loveth us,
> He made and loveth all."

Nature study impresses one with the importance of the so-called lowly things. The balance may at many a point be easily upset. In the natural world as well as in the spiritual this is true. "For God hath chosen the foolish things of the world to confound the wise; and God hath chosen the weak things of the world to confound the things that are mighty; and base things of the world, and things which are despised, hath God chosen, to bring to naught things which are."

How often is this exemplified in the study of nature. A world all lilies, butterflies, goldfinches, peacocks, generals, lawyers, or policemen would not be a well balanced world. You must have corn and potatoes and chickens, and men with the hoe. Such truths of the balance of nature and of civic life should be correlated with nature study. There is a mighty lot of such truth expressed in this statement by Richard Jeffries:

" Could imperial Rome have only grown sufficient wheat in Italy to have fed her legions, Cæsar would still be master of three-fourths of the earth. Rome thought more in her latter days of grapes and oysters and mullets that change color as they die, and singing girls and flute-playing, and cynic verse of Horace—anything rather than corn. Rome is no more, and the lords of the world are they who have mastership of wheat."

In an interesting account of searchings for the wild mouse, Dr. C. C. Abbott interpolates this statement :

" The whole world is thick with fools who have lost all because of their insane desire to better their conditions. Early in life we reach our proper level, and he is blessed who has no ambition to soar above it."

Then he goes on to tell us about his mouse. At first reading this seems incongruous. It is merely nature study illumined by a flashlight of true democracy.

Correlate nature study in large quantity and persistently with patriotism, that important part of a child's education which is somehow erroneously supposed to have its root in fighting and in political intrigues. It is not *civil* history but

natural history that should primarily be correlated with patriotism.

What is patriotism? Love of country, is it not? the country including the little congestions which we call villages and cities, the country itself, not mere pride in victories of warfare, ability to fight, nor in political intrigues past or present, but

> "I love thy rocks and rills,
> Thy woods and templed hills;
> My heart with rapture thrills
> Like that above.
>
> "Let music swell the breeze
> And ring from all the trees.
>
> From every mountain side
> Let freedom ring."

That is patriotism; that is love of country, our beautiful lovable country. Is not a great deal of what we call patriotism missing the main thing, mere machinery of patriotism? Is not much of our so-called patriotic teaching the mere mechanics of warfare and politics—so much so that the real love of our country is lost sight of? Let us talk less about our savage fighting and "the men behind the guns," and more of the real thing that we have been seeking to establish—love of our beautiful country. So correlate nature study with

patriotism and let patriotism grow out of our love of nature study. For nature study, rightly understood, is not a matter of bugs and snakes, but of the highest and best patriotism. It is a matter of the trees, the roads, the sunsets, the clouds, the old homestead, the city home and its surroundings, although in the city there may not be much that is attractive except the blue sky and the stars. And here comes in the fighting part but only secondarily. The naturalist—using the term in its broadest sense—is your true patriot. The naturalist so loves the hills, the valleys, the fields that he would lay down his life for them, and his brothers and sisters of dear Mother Nature.

The native land *and* God. That sums it all. Love of native land—nature study—brings our thoughts and our life to a higher plane.

And right here is another important part of a child's education, his moral training, to be thoroughly correlated with and produced by nature study.

"The sunset is unlike anything underneath it; it wants men." You can never improve that child by preaching words alone. Influence by example and association. The story of the naughty boy that came to some bad end, and of the goody-

goody boy that became a millionaire and played golf and drove an automobile is not effective because it is not true to life, and the child soon detects the sham. But the flower is ever beautiful, the bird is ever joyous, and nature *is* always true. More than stories with a moral do I value nature for morality.

> "Nor hev a feelin' if it doesn't smack,
> O' wut some critter chose to feel 'way back;
> (Why, I'd give more for one live bobolink
> Than a square mile o' larks in printer's ink.)"

Would you have the child pure? Let him associate with purity. Says Thoreau:

"Exquisitely beautiful and unlike anything we have is the first water-lily just expanded in some shallow lagoon where the water is leaving it, perfectly fresh and pure before the insects have discovered it. How admirable is its purity. . . . It is the emblem of purity and *its scent suggests it.*"

Would you have the child beautiful—real beauty permeating every fiber? Says Burroughs:

"Nature does nothing merely for beauty; beauty follows as the inevitable result. . . . Indeed, when I go to the woods or fields, or ascend to the hilltop, I do not seem to be gazing upon beauty at all, but to be breathing it like air. . . .

It rises from every tangle and chasm. . . . I am not a spectator of, but a participator in it."

Would you have the child joyous? Says the Rev. Dallas Lore Sharp:

"The joy in wild things is the joy of being wild with them—vacation joy."

And so we can go to nature for all excellencies, and she is constantly trying to win us. Or, as Walter Savage Landor has expressed it:

> "We are what suns and winds and waters make us;
> The mountains are our sponsors, and the rills
> Fashion and win their nurslings with their smiles."

Correlate the child's moral training with the truth, beauty, and loveliness of nature. With nature study *may* be correlated the minor matters which you are so accustomed to associate with it. With your nature study *must* be correlated these higher matters if you would rightly teach. What a suggestion has Walt Whitman given us for correlation:

> "There was a child went forth every day,
> And the first object he looked upon, that object he became;
> And that object became part of him for the day, or a certain part of the day, or for many years, or stretching cycles of years.

The early lilacs became part of this child,
And grass, and white and red morning-glories, and white and red clover, and the song of the phœbe-bird.
And the fish suspending themselves so curiously below there, and the beautiful curious liquid,
And the water-plants with their graceful flat heads—all became part of him."

But your nature study must be correlated with something even higher than all this. It must reach the highest spiritual faculties, reaching out, aye, taking hold of the Great Infinity. Your nature study must be correlated with a religious life. If you are doing that, you are doing the best correlating. You are realizing what nature study means! You are agreeing with Emerson:

"Every earnest glance we give to the realities around us, with intent to learn, proceeds from a holy impulse, and is really a song of praise. What difference can it make whether it take the shape of exhortation, or of passionate exclamation, or of scientific statement? These are forms merely. Through them we express, at last, the fact that God has done thus or thus."

"To lead a little child into this beautiful world and open his eyes to the marvels which await him, is a most precious privilege. He could stumble along without leadership, and he would see many things. But how much a guide is worth! Parents may well put themselves to great pains for the sake of introducing their children to Nature. No effort will bring any greater reward. They may open these young eyes to the color of the birds, to the varieties of the trees, to the delicate beauty of the commonest wayside flower, to the intricate traceries of a butterfly's wing, or the grace of a clinging vine, to the glory of the sunset and the grandeur of the lightning. Children may be taught to distinguish bird notes and name the common birds. Their eyes may be trained to the harmonies of color and the marvellous detail in the frost and the snowflake. No child will be cruel to birds or insects or animals of any sort, if he is properly introduced to them and learns their true place in God's marvellous universe. A sensitiveness to the beauty of the world and the infinite love manifested in its wonderful resources, means much to develop the mature character. This is wanting in many a man and woman because there was no one to guide their early years."—Rev. Edward Herrick Chandler.

CHAPTER V

"KEEPING THEM DOWN"

"Well, I suppose that is all right, but please tell me how I am going to get them down again?" she said in a low tone to the superintendent, as I went out of the room. The words were not intended for my ears, but I caught them, and they touched me, every bit of me.

She was a teacher who thoroughly believed in discipline. Every action in the school favored of militarism. She was famous throughout the town for her good government. When the superintendent and I entered the room she came forward very primly, and I thought grimly, but perhaps that was imagination, the result of the superintendent's casual remark, "You will have to be a little careful with this teacher. She is great on discipline and routine, and says that she doesn't believe in modern fads." The good old methods of the days when Webster's blue-covered spellin' book was paramount, were good enough for her.

After acknowledging the introduction, she turned and said:

"Now, children, this is Mr. Bigelow. He knows everything about the trees, and flowers, and birds, and bugs, and such things, and he has come here to tell you all about them. [A large contract, I thought.] Lay aside your books and papers; now sit up and fold your arms and pay strict attention. You must be very still. He is going to talk for three-quarters of an hour, and he will tell us a great many interesting things, I am sure."

After a minute or two made noisy by the putting of books into desks, one could almost painfully hear the *tick-tock* of the clock. The teacher turned to me, and, as she nodded her head, said:

"Now, Mr. Bigelow."

Then she went to the opposite corner and stood there, with eagle eye wide expanded to detect the earliest sign of disorder. In the meantime she had sent an assistant to the rear of the room. I paused for a moment to enjoy the air of expectancy and the almost breathless stillness I noted the glistening eyes of a few, and the soldier-like indifference of most of the pupils. Three or four big boys in the rear seats had especially attracted my attention, by the look, half of disgust, half of protest, with which they had swung books out of sight, and stuffed their hands into

their pockets. I had seen that look before! I knew how to translate it into, "Oh, this is going to be a goody-goody talk to tell us how we ought to enjoy this beautiful world and be very grateful to the One that has given it all to us." With an air of resignation they leaned back, and I remembered the factory that we had just passed, and what the superintendent had told me of the dull work, the long hours and the low pay of the operatives.

Then I said:

"I am trying to find out how young folks feed their pet animals. Will some one please tell me what he thinks is the best for his special pets? A friend of animals has written to me that bread and milk should not be fed to any pet animal, and I am trying to learn about the experience of others. Will some one please speak and tell me?"

Simple as this inquiry was, it had the effect of a bomb-shell. The mental attitude was completely upset and I had to wait a minute for it to settle. Here was every one, other than myself, expecting a sermon on the wonders and beauties of nature about which the young folks had from earliest childhood been told and told again. And I felt

almost culpable as I thus jerked their minds "the other end to." They to give information and I to be the learner! Impossible! It took a minute for the idea to penetrate, for the hands to come out of the pockets and the legs to be drawn up, while looks of astonishment passed from one to another. Faces brightened, eyes began to sparkle, a hand here and there came up hesitatingly. I had touched the known in a place dear to the hearts of those young people. The matter of food was soon explained. Then what stories of dogs, cats, parrots, canaries, hens, rabbits, and even of a pet crow. The story of this crow's capture led to an experience, related by one of the big boys about his dog and a woodchuck killed in the stone wall, and how the little woodchucks were brought home. I was delighted; the superintendent's countenance beamed with pleasure, I saw that he was convinced, and later I was not surprised to have him write to me, "We have room for the kind of nature study which you exemplified." But the teachers were alarmed, almost excited. The eagerness of some of the children to tell experiences actually pushed them out of the seat and several steps forward, with outstretched hand. Oh, the joy of telling!

the joy of being appreciated, of being recognized as actually knowing something worth listening to! Every mind woke up, because each was appealed to individually, and every one was eager to respond. The assistant expressed volumes when she whispered to me, as I shook her hand in parting, that she "Didn't think those children knew so much."

But the principal apologetically said, "I never saw them act so badly. I'm afraid you'll think we don't have any order. I was ashamed to have two or three talking at once."

To her I said, that they had been only a little over-eager in telling me their experiences. But to you I say that I commend the young folks. I regretted that there was only one opportunity of telling; that there must be a condensation of what should have been extended.

The principal then made the remark to the superintendent, as quoted at the beginning of the chapter.

Discipline, and instruction are for your school, as a whole. Nature study is for the pupil—this one, that one—a recognition and development of individuality. Restrain *and* develop. Not one, but both. Not everlastingly keeping them

down, but sometimes letting, helping, encouraging, to spring up. That is why I appeal to you for informal nature study, for the very young folks, not instruction in science, however elementary, or however dilute and interesting you may be able to make it. Think and act sometimes from the child's standpoint. That in relation to natural objects is nature study.

CHAPTER VI

WHY NO SCHEDULES FOR NATURE STUDY

What is nature study? It is a point of view. It is the acquirement of sympathy with nature, which means sympathy with what is.

As a pedagogical ideal, nature study is teaching the youth to see and to know the thing nearest at hand, to the end that his life may be fuller and richer. Primarily, nature study, as the writer conceives it, is not knowledge. He would avoid the leaflet that gives nothing but information. *Nature study is not method.* Of necessity each teacher will develop a method; but this method is the need of the teacher, not of the subject.

Nature study is not to be taught for the purpose of making the youth a specialist or a scientist. Now and then a pupil will desire to pursue a science for the sake of the science, and he should be encouraged. But every pupil may be taught to be interested in plants and birds and insects and running brooks, and thereby his life will be the stronger. The crop of scientists will take care of itself.—Professor L. H. Bailey, Professor of Horticulture at Cornell university.

Books of natural history aim commonly to be hasty schedules, or inventories of God's property, by some clerk. They do not in the least teach the divine view of nature, but the popular view, or rather the popular method of studying nature, and make haste to conduct the persevering pupil only into that dilemma where the professors always dwell.—HENRY D. THOREAU, the sage of Walden.

Professor Bailey is a prominent scientist of the present day, whose writings are chiefly scientific.

He occasionally views nature informally, as in his famous article on nature study from which the foregoing is quoted.

Henry D. Thoreau was the first and is generally accredited to be the greatest of American naturalists. He occasionally looks at nature from the scientific point of view, as is evinced by his assistance to Agassiz. Thoreau is a naturalist; Professor Bailey a scientist. These are two different points of view, although there is no opposition nor hard and fast lines. The most successful scientist must have much of the naturalist ("Nature Study") in him, and the naturalist's love leads him to more and more of scientific knowledge. It is not a question as to whether one has a naturalist's love, and his ability to see things, or whether he has a scientist's knowledge. Each man must have both qualities. The question is, of which quality has he the most? and the answer decides whether he is a scientist or a naturalist. I take these two men as typical of the two classes, notwithstanding the fact that each has much of the spirit of the other. Both Bailey and Thoreau have recognized that there is a difference between nature study and science. Here is Bailey's way of making the distinction:

Nature study is not the study of a science, as of botany, entomology, geology, and the like. That is, it takes the things at hand and endeavors to understand them, without reference to the systematic order or relationships of the objects. It is wholly informal and unsystematic, the same as the objects are which one sees. It is entirely divorced from definitions, or from explanations in books. It is therefore supremely natural. It simply trains the eye and the mind to see and to comprehend the things of life ; and the result is not directly the acquirement of science, but the establishing of a living sympathy with everything that is.

Thoreau in "Spring" draws the distinction in his characteristic style as follows :—

As it is important to consider nature from the point of view of science, remembering the nomenclature and systems of men, and so, if possible, go a step further in that direction, so it is equally important often to ignore or forget all that men presume that they know, and take an original and unprejudiced view of Nature, letting her make what impression she will on you, as the first men, and all children, and natural men do. For our science, so called, is always more barren and mixed with error than our sympathies are.

It has been seen in the two introductory paragraphs of this chapter, that both denounce schedules or definite method. "Why is this?" asks many a teacher. "Isn't it a good thing to have your work assigned in advance?" Yes, but nature study is not *your* work. *It is from the standpoint of the loves and interests of the child,* not from that of your knowledge. You will make

schedules of assignments in advance, when you can predict in advance what each child will find of interest or will desire to tell you. Bailey and Thoreau denounced schedules in nature study because they recognized this distinction. And the trouble with you who clamor for machine-made schedules, is that you fail to recognize the two points of view. If you did not, you would not ask for schedules.

Schedules are useful in science, even the most elementary. It is right that you assign the consideration of the stem the day after that of the root, or *vice versa*, if you so please. You may assign newts after the fishes in zoological work. You are instructing in that; that is *in struere*, building in, to the child's mind, but in nature study you have the true education, *e ducere*, leading forth the child's ideas.

The pernicious custom of ignoring the child's individuality in assigning the same thing to all, and of having a definite assignment for each day, without regard to the excellent and unusual available things that may come to hand, reminds me of a farce, entitled "The Railroad Restaurant," that I once saw acted by the young men of a literary society. I do not mean to assert that

nature study in definite assignment for each day, and uniform to each pupil, is a farce. By no means, for the farce pleases, even if there is no definite instruction. On the other hand a scheduled assignment may do positive harm by stunting growth of interest.

The "Railroad Restaurant" farce was extremely simple and ridiculously funny. The waiter pounded the gong, the passengers rushed in and took seats at the bare tables. The waiter threw the gong into the corner, and hurried from one to another of the would-be diners, hastily inquiring, "What will you have?" but ignored all the answers. From an armful of huge soup plates he slammed one on each table. Then he rushed to the pantry, tugged forth a pail of soup and set it in the middle of the room.

Filling a Brobdignagian squirt-gun with the entire contents of the pail at one tremendous pull of the plunger, he rushed from diner to diner, shouting as he filled the plates to overflowing, "You've only five minutes before the train goes, and we've only soup ready to-day; you'll have to make out on soup." Hastily returning the squirt gun to its place, he sounded the gong; the locomotive bell rang; the conductor shouted

through the half opened door, "All aboard!" and there was a rush for the train.

Perhaps the audience saw only a burlesque on the methods in vogue at railroad restaurants, but into the mind of at least one who was present there floated a remembrance of a certain schoolroom. Flushed and eager from outdoor exercise and interests, a crowd of happy children walked briskly into the room and took their seats.

"What have you, there, John, that is attracting so much attention?" sharply inquired the teacher.

"A little spotted turtle; we found it down by the spring and——"

"Carry it right outdoors and leave it there. You ought to know better than to bring such a thing into the schoolroom—of all——"

"But please, ma'am, I thought you might want it in nature study," replied the boy, as a few in his immediate vicinity pressed forward to see it, and in various parts of the room a dozen or more hands came up from excited children, who had evidently participated in the capture of the turtle, or who wanted to see it. "No, we don't want it to-day. Don't you know that we commence the study of the local amphibia on the 15th

of April? To-day our schedule says we are to have buds. I have an armful of specimens here on my desk, as you can all see. I was out hunting for them before some of you children were out of bed."

John, rather crestfallen, in a mystifying guilt as to his "amphibia" stumped along in the manner that only a boy of repulsed interests can do, and carried the turtle out of doors. The other children wilted in their eagerness, and slumped into their seats. The hand-bell rang snappishly, the children stiffened, with rigidly folded arms, and perfect order reigned in that schoolroom. No *a la carte* in that mind restaurant, but a public institution of diet changed only after long routine and per schedule.

And yet as I day-dreamed there, I thought what an ideal teacher she is. What a good disciplinarian, how perfect in her manner, how conscientious and thorough, in everything that she does. Her principal has required "Fifteen minutes a day for nature study, preferably after the opening exercises." (Get it off your hands as early in the day as possible, so that you will be ready to do something—this was not in the schedule, but I felt it; perhaps I was wrong, perhaps not.) The

teacher congratulated herself because she could not do a thing half way. She must have a time for everything and everything for a time. She had therefore met a few other teachers in the building, and they had prepared this schedule, which had met with the heartiest approval of the principal.

"That teacher is so thorough," said he with emphasis and with pride, as he exhibited the schedule, "she does everything thoroughly."

Do you not know that you have systematized and scheduled *in* elementary or dilute science and *out* every particle of nature study? I saw the boy carry it out in his heart, face, and hand.

Again I visited that school. I knew Sam. He lived not far from my home, and we had had many an enjoyable walk together in the great outdoor world. He had a general interest in all natural objects, but he dreamed of pet mice. That boy was an enthusiast, and consequently an authority on pet mice. I heard the teacher read a part of the interesting chapter, "Wild Mice," in Ernest Ingersoll's book on "Wild Life of Orchard and Field." Sam and the other children listened attentively as the teacher read:

These jumping mice are the prettiest of all the Eastern

wild species. If you should look at a kangaroo through the wrong end of a telescope you would have a very fair idea of our little friend's form, with hind legs and feet very long and slender, and forelegs very short; so that when he sits up they seem like little paws held before him in a coquettish way. His tail is often twice the length of his body, and is tipped with a brush of long hairs. He has a knowing look in his face, with its upright furry ears and bright eyes.

Then the teacher took down her new copy of Witmer & Stone's "American Animals," and let the children enjoy those two plates of photographs of the skins of various mice and shrews.

I watched Sam. And Sam looked at me occasionally in an eager way. He reminded me of my old dog Daisy, when I held her trembling in eagerness, with the woodchuck only two feet from her nose, and plainly visible under the boulder at the bottom of the dilapidated wall.

The teacher read on, about the meadow mice that "are the homeliest of their tribe," and about the deer mice and the white-footed. And again the photographs of the skins were passed around.

Sam, I thought, I know that you would like to get right into this, right up here with the mouse that you caught in the meadow day before yesterday, and bring in that wood mouse, and a few of those "fancy" pet mice, the waltzing ones in particular, and tell us more than the books and we

have ever known, perhaps not about mice, but about the enthusiastic pleasure of keeping them and caring for them. It takes a boy to know that! If the big man that writes books really knows that, it is because he has remained a boy; he may have the man's body, yet he retains the boy's heart.

One scientist with a grown up body and a boy's heart, Professor Clifton F. Hodge, writes:

> But after all, childhood—active, fresh spontaneous childhood—and its need of the normal environment for growth and vigor, supplies the imperative demand for a natural and active nature study. Truly "trailing clouds of glory do we come"; and when we discover the right way, there shall be no "shades of the prison-house" to "close upon the growing boy!" In rare cases now we find the charm of childlikeness, the open interest and rapid growth, extending on through boyhood and to the end of old age. When we learn how to educate normally, this may become the rule rather than the exception.

The teacher read on in her book, while I had been silently soliloquizing. The schedule was one on mice in the last of two weeks' assignment on rodents.

I fear that my mind wandered from the reading for I know the children and their interests. Sam let me have a pair of waltzing mice, and had been giving me lessons in feeding them. I asked him

after school if the teacher had ever been down to see his pets, and he said he had once invited her, and she seemed somewhat interested, but she must walk that afternoon with another teacher in the woods by Reginald park to get some leaves for the next day's lesson. He guessed she forgot it afterwards.

Then I forgot that Sam was walking with me, and my mind wandered again. I was thinking about some of the others in the school that had special interests, and I wondered and I wondered till there floated through my mind another thing that I had read in Professor Hodge's "Nature Study and Life:"

> In adult science we have been studying dead things so long, dissecting and analyzing type-forms, that we have well-nigh gone blind to the living, active side of nature; but this has furnished the primitive and fundamental, and must furnish the larger future, interest of mankind in nature. So completely does this side monopolize our college and even university courses in biology that our teachers know nothing else to teach.
>
> However much value this may have for the adult thought, *when we attempt to teach little children we must moult it all, heed every suggestion of the Great Teacher, and become as little children ourselves.*

There you have the solution. Just so long as you let dilute or elementary science (good as it

may be in its place) crowd out all nature study, just so long will you need schedules. Every time you ask for a schedule, every time you make all the pupils do the same work on the same object, *you are teaching science.* Not that I love science less, but, for the young folks, that I love nature study more. I appeal to you to take the things that come to hand and as they come to hand, and let your young people develop along the line of individual preferences. For nature study is not to be taught. Never make a mill of your school with an everlasting grind, grind, grind, and everything going into one hopper. You are developing human beings, *human beings* (not naturalists nor teachers) trained uniformly in some things, but with enough nature study and some other things to preserve and develop individuality.

And yet a mere objection to schedules does not seem to get wholly at the heart of the matter. There surely is no harm in intelligently planning a line of thought, or of suggesting to the young folks what they will find of interest for the week or month.

Perhaps we get at the real difficulty from another point of view, if we summarize by saying that it is *all right for the teacher to make the schedules;*

all wrong for the schedules to make the teacher. Keeping a diary may be a pleasant and profitable outpouring and developing of one's best self; the diary may be a drudge-making master. So it is with schedules. It is all in the way the teacher uses them. This does not mean a compromise with a thing of evil; it means the right use of a thing that in itself is essentially good. But it is a thing so commonly misused that it most often seems best to omit it entirely. "If thy right eye offend thee, pluck it out."

Perhaps my strong dislike for schedules in nature study, amounting almost to repugnance, is due not so much to anything intrinsically wrong in having schedules as in misusing them. Your nature study must develop the spontaneity, individuality, and interest of the child. *It must wake him up and lead him out* as no other study can. So far as a method or definite line of thought on your part will aid in doing this, so far it is good. When your method tends toward machine instructing, then it is wholly bad. I have seen much of this bad kind, hence, not because I love schedules of the right kind less, but because I love the child more, I have said "out with them." They are dangerous unless used with extreme skill.

"Whoever has not in youth collected plants and insects, knows not half the halo of interest which lanes and hedgerows can assume. Whoever has not sought for fossils has little idea of the poetic associations that surround the place where imbedded treasures are found. Whoever at the seaside has not had a microscope and aquarium, has yet to learn what the highest pleasures of the seaside are."—HERBERT SPENCER.

"Culture consists less in wide knowledge than in wider sympathy; not so much in stores of facts as in ability to transmute facts into knowledge; not only in well-grounded conviction, but in toleration; not alone in absorption of wisdom, but as well in its radiation; in patriotism that is without provincialism; in the development of character. But since individual minds differ much in their composition, no one kind of treatment can be best for all, and the ideal system will be that which is elastic enough to allow each to receive what is best for it. True culture, then, cannot be obtained by forcing all minds into any one mould however carefully that may be made, but it is rather attained by allowing each mind to expand for itself under a proper combination of nourishment from within and stimulus from without."—WILLIAM F. GANONG, Ph. D., in "The Teaching Botanist."

CHAPTER VII

WHAT I DO CARE FOR

"Oh, I don't care for that!"

"And neither do I!" I did not say so to him, but I say it to you.

I thought (and I still think), that the principal of that normal school spoke somewhat sneeringly. I had made a distinction between the study of nature as the informal, intimate, sympathetic, unsystematic view of living things, and the pursuit of science as the formal, intellectual, professional, systematic, and synthetic treatment of animate objects. But I made no reply to the covert sneer. The conversation dropped with his remark. He seemed inclined to think that I was quibbling over a matter of names, and I felt that if I attempted an explanation it would be like showing the east where the west is.

The trouble was right here. So far as he had any views of nature he was scientific. He was a systematist. Everything that came to his mill always dropped in at the same place, and was

ground out in the same style. A peck took the same course as a carload.

If you say that nature study is merely the study of nature (and that is natural science whether for the university or the kindergarten), and that all this talk about a distinction in the terms nature study and elementary science is bosh and you do not care for that, then I say too: "And neither do I."

You may call your systematizing and your generalizing all the way from your Ph.D. down to the little fellow whom you are helping to put on his rubber shoes, you may call it nature study or what you please. You may demonstrate to the one that the centralizing tendency in the nebulæ is the same that draws the apple to the ground. You may draw as many diagrams and make as many x, y, z's, as you please. You may classify and arrange and evolutionize to your heart's content. You may even dilute the same method and apply it to the little fellow if you want to, and as you pull on the second overshoe, you may tell him that he has two feet and the Tom-turkey gobbling outside the window has the same number, and the chicadee the same, and then you can inform him, if you are determined

to do it, that they are all in the one class of bipeds. You may generalize still further, since the pussy cat is purring to say good-bye, as the boy's father drives up with a prancing horse, that cat and horse are both quadrupeds, and that the elephant is likewise a quadruped. The next day you may put down the whole list on the blackboard, and talk till you are exhausted, and the children, too. And your only reward will be exhaustion!

"But I don't care for that," with these little folk. I want you to let the little fellow get acquainted with that particular Tom-turkey, not some other one, and that chicadee, that cat, that horse, without reference to any other biped or quadruped in the world.

I would give more for the boy's ability to see that one cat, and for his power to develop his originality in his own way, and for his skill in saying what he wants to say about the cat, than to have him tell you of all the kangaroos and lemurs and platypusses that ever ornamented the finest chromo-chart that ever an enterprising agent sold to your school board.

But for that child, have something in nature-viewing that will let him find himself (not be

machine made, with others like pins on a paper), that will bring out his love for living things, increase his ability to admire, to see and to enjoy, and to tell you in his own way, about the objects that interest him, not such things as you provide uniformly according to some schedule. For this I plead and for this I do most emphatically care. You may call it nature study, elementary science, nature love, observation lessons, as you please. But I plead with you not to monopolize all the names into your dilute science, and leave out what I call nature study. No, I do not call it quite that. If I were asked to suggest a more expressive title for what I commonly express by the term nature study, and for what I most desire, I should call it nature sympathy and appreciation.

CHAPTER VIII

LOVE OF NATURE AND THE LOVE OF MOTHER

Nature study is not one of the utilitarian studies. It must not be expected to do something it should not do. It may coalesce with other departments of an education, and should do so, but it is not a stepping stone to them; it stands alone. Language-study, drawing, and even mathematics, may be benefited by companionship with it, but they should never be allowed to use nature study as a tool for their own purposes.

In its effect on character building, nature study is closely akin to patriotism, as I have already said in a previous chapter, and to the life of the individual.

The sentiments are so closely allied that they may be said to be companions; and what ex-President Harrison writes in the introduction to "This Country of Ours," may well be remembered for the excellence of his proposed methods toward character building.

After citing examples of love, indifference and

disregard as characteristic of various nations, he says:

"If we would strengthen our country, we must cultivate a love of it in our own hearts and in the hearts of our children and neighbors; and this love for civil institutions, for a land, for a flag, if they are worthy and great and have a glorious history, is widened and deepened by a fuller knowledge of them.

"A certain love of one's native land is instinctive, and the value of this instinct should be allowed, but it is short of patriotism. When the call is to battle with an invader, this instinct has a high value. It is true that the large majority of those who have died to found and to maintain our civil institutions were not highly instructed in constitutional law; but they were not ignorant of the doctrines of human rights, and had a deep, though perhaps very general, sense of the value of our civil institutions. If a boy were asked to give his reasons for loving his mother, he would be likely to say, with the sweetest disregard of logic and catalogues,

"'Well, I just love her.' And we must not be hard on the young citizen who just loves his country, however uninstructed he may be.

Nevertheless, patriotism should be cultivated, should in every home be communicated to the children, not casually, but by plan and forethought. For too long our children got it as they did the measles, caught it.

"Now, in the schools, American history and American institutions as serious and important studies are beginning to have more, but not yet adequate, attention.

"The impulse of patriotism needs to be instructed, guided, brought to the wheel if it is to do the everyday work of American politics."

"Sentiment, yes, never too much; but with it, and out of it, a faithful discharge of prosy routine of a citizen's duty. A readiness to go to the fields? Yes, and equally to the primaries and to the polls."

That is patriotism in the elementary schools from the natural standpoint, that is building the citizen from the heart. That is beginning at the right end. What a foundation on which to rear the various superstructures required in the upbuilding of a community!

Loves his mother, "Well I just love her." I like that standpoint of loving his country, and the same spirit in loving this wonderful and beautiful world.

Oh, no, some scientific appreciator of a mother may say, that is crude; it flavors of the Middle Ages, of the amateur, of those who love their mother from the heart. This is an age of scientific spirit, an age of the intellect rather than of the affections.

Do nothing so simple as that; learn really to know your mother, and then you can love her with solid, intellectual appreciation.

First collect some pictures and drawings of all the mothers you can find; arrange them side by side and compare your mother with them. That will add to your knowledge of the comparative merits of mother's personal appearance.

Devote a half-hour at a certain time every day to the study of mothers. Draw pictures of them; make a detailed list of color of hair, number of eyes, nostrils, ears; length of chin, height, weight, number of fingers on each hand; state the age, past history and a hundred or more other facts. Arrange these details under a few heads, draw a bracket before each, and collocate these in line under one big brace, with the word *Mother* written in capital letters.

Make a drawing of your own mother standing erect, and also bending down to kiss you as you

start for school in the morning. Sketch in detail her eyes, fingers and nose.

Write a list of nouns, adjectives, verbs and adverbs that will apply to your own mother, and from these compose ten sentences each day from 10:15 to 10:45 A. M., in connection with the drawing work, and if the task is completed before the time has expired, we will fold our arms and sing about our mothers. Bear in mind that you must never really go to see your mother for the enjoyment of seeing her, nor only for the enjoyment of her loving presence, but you must learn to love her, and to let her influence permeate every fiber of your life, by noting down with pad and pencil, all possible details of her physical structure.

But we all know that this is not the method of securing the highest degree of love for nature; in fact such a method would tend to obtain a heart-felt love for one's own mother.

Too much detail, too much method, too much correlating kills it.

"Nature Study is the means of training persons to come into thoughtful contact with Nature. It thus becomes an art and not a science, excepting in its relations to the Science of Pedagogy. It is the art of training in the methods of studying those things which are the foundations of the natural sciences. It differs from science in many respects. It also differs from Object Lessons based upon natural material. The success of Nature Study depends upon the teacher and not upon the subject."

—PROF. H. A. SURFACE.

"For many years it has been one of my most constant regrets that no schoolmaster of mine had a knowledge of natural history, so far at least as to have taught me the grasses that grow by the wayside, and the little winged and wingless neighbors that are continually meeting me with salutations which I cannot answer, as things are. Why did not somebody teach me the constellations, too, and make me at home in the starry heavens which are always overhead, and which I do not half know to this day."
—THOMAS CARLYLE.

"All things are beautiful,
Because of something lovelier than themselves,
Which breathes within them, and will never die."

—LUCY LARCOM.

CHAPTER IX

SCIENCE IS NOT ALL

We all want science in our colleges, science in our high schools, and we want it systematically taught. Our educational periodicals should head their departments of science, as science. We teach science, then why not, in the name of common sense, call it science.

But that is not all. We want, previous to it and with it, hand in hand as closest companions, another important factor, a daily communion with the natural things of this world.

Before and during our study of science we need an acquaintance with nature like that of a child with his mother.

" To teach young people or old people how to observe nature, is a good deal like trying to teach them how to eat their dinner. The first thing necessary in the latter case is a good appetite; this given, the rest follows very easily. And in observing nature, unless you have the appetite, the love, the spontaneous desire, you will get little

satisfaction. It is the heart that sees more than the mind. To love nature is the first step in observing her. If a boy had to learn fishing as a task, what slow progress he would make; but as his heart is in it, how soon he becomes an adept.

"The eye sees quickly and easily those things in which we are interested. A man interested in horses sees every fine horse in the country he passes through; the dairyman the cows; the bee culturist the bees; the sheep grower the flocks, etc. And it is even said that the ladies require no effort to note the new bonnets and cloaks on the street. If one is a lover of birds or flowers, he easily sees birds or flowers everywhere. The fact is we all see and observe easily in the line of our business, our tasks, our desires."

I would not teach a beautiful, rhythmical recitation about the sturdy oak, its leaves and acorns, and then find, as I did in one city schoolroom, that not a child there had ever seen an oak leaf nor an acorn.

See the bird capturing insects for food; see the insects feeding on the plant which draws its nourishment from the ground under the influence of the beneficent sunshine. That is nature study,

and it covers ground that the individual sciences do not even touch.

Teach nature study by the natural, boy-and-girl method. That is the way John Burroughs, William Hamilton Gibson, and others got more than seventy-five per cent. of their knowledge of nature, and from that rough-and-ready natural method of acquiring it, they gained a full storehouse, from which each drew according to his own testimony, for all the rest of his life.

We should teach this nature study in this haphazard, natural unsystematic manner, just as things come to hand, or as we are able to plan for their coming to hand. With it and beyond it we should teach and study science, strict, accurate, scientific science.

I would give to every boy or girl as nearly as possible the same that the wide-awake child in the country has, or what Whittier calls the "Knowledge never learned of schools." And on that solid foundation I would build the noble, valuable superstructure called science.

I would have the boys and girls rush over to the apple tree, pick up handfuls of apples, putting some in pocket and munching the rest. That is nature study in the natural manner. I would have

those same boys and girls sit at the table and make cross sections and vertical slices of some of those apples, noting the structure, the relation of seeds, cases, pulp and epidermis. That is science, and a science not injured by previous "nature study."

I would have the young folks climb on the ledge, stand near the boulder, and have a general good-time in fun and frolic. That is nature study. I would tell them a little of the history of this ledge, its relations to the surrounding country, its geological structure and perhaps its chemical composition. That is science.

Enjoy the beautiful moonlight; note the bright stars and planets, and construct the fanciful pictures of the constellation. That is nature study. Tell of the surface of that moon, the distance of the stars, the various physical characters of the planets. That is science.

CHAPTER X

"WHAT DID YOU GET?"

"We are indebted," says a writer in "Science Gossip," "to the humorous pencil of Leach for a sketch of a languid gentleman, who, pining for a new sensation, is trying the effect of riding up and down the Strand, seated on the roof of an omnibus and picking out periwinkles with a pin. Should you ever feel as though you had exhausted all the resources of the civilized portions of the globe, do not seek for distraction in boiled cockles or in pickled whelks, but go away to the top of a hill, with woods and streams, and smiling fields dotted with farmsteads and villages spread before your feet, and there rest in solitude and wait on Nature, and listen and watch for all that her offspring will do above, below and around you, while the teeming planet turns once around its axis. Then seek a similar communion with the sea; study it from even-fall to broad daylight from the top of some lone, unfrequented cliff; or better still, commit yourself to the heaving bosom of the great waters,

and unless your soul be blind and deaf, you shall learn things never before dreamed of in your philosophy."

"What did you get?" Castellar tells you:

"Oh, Nature; immovable in the midst of movement, unique amid variety, surrounded with ether which penetrates every pore, forming the spirit and its atmosphere, with the continual succession of organic beings which change and are transformed. Oh Nature! durable and unchangeable; subject to death and to eternity; to the limited and the infinite; diffused over the immensity of space and compressed into organic beings from the stars which irradiate the heavens to the flowers which perfume the air with their aroma; from the unspeakable gases that evaporate, to the great mountain chains with their glaciers, where the snow whitens the volcanoes struggling with internal fires; from the almost imperceptible nebulæ, the great worlds which travel through space; from the grain of sand drifted by the wave, to the furthest stars of the Milky Way, whose light reaches us in twenty thousand centuries."

"What did you get?" Hear John Tyndall's answer:

"The lilies of the field have a value for us be-

yond their botanical one, a certain lightening of the heart accompanies the declaration that 'Solomon in all his glory was not arrayed like one of these.' The sound of the village bell which comes mellowed from the valley to the traveler upon the hill has a value beyond its acoustic one. The setting sun where it mantles with the bloom of roses the Alpine snows, has a value beyond its optical one. The starry heavens, as you know, had for Immanuel Kant a value beyond their astronomical one."

What did you get? What did you learn that you did not know before? Get? We got a foundation to all the Sciences. In meteorology we got the sunshine, the beautiful blue sky, the invigorating air, and the refreshing breezes. In geology we got a delightful tramp over the hills, through the moist and shady gorges, across the blooming fields. In entomology, ornithology, and botany we obtained not only enjoyment but inspiration.

Within my own personal experience, a science teacher expressed surprise that, in my field work with the pupils, so few names were mentioned, so few pencils and so few pads of paper used. Enjoyment? So you want to have a good time?

Certainly. For a good time the pure pleasure of a delightful tramp.

"Walking should be cultivated as an accomplishment. Excursive legs help to make an ex cursive intellect, and among the aids to reflection, not enumerated by Coleridge, are long strolls. Children, especially, should be trained to walk long distances, and to despise short ones. Walking is a cheaper and more healthful exercise than riding, and it has the added advantage of training to endurance."

On the same subject, hear what Rousseau has to say:

"Je ne conçois qu'une manière de voyager plus agreéable que d'aller à cheval; c'est d'aller à pied. On part à son moment, on s'arrête à sa volonté, on fait tant et si peu d'exercice qu'on ne veut. Quand on ne veut qu'arriver, on peut courir en chaise de poste; mais quand on veut voyager, il faut aller à pied."

CHAPTER XI

COMMONPLACE NATURE

In stating facts never search for the most startling. Nature in her simplicity is amply wonderful and instructive. I know a girl that came home from school, and said that the teacher had been giving talks on astronomy. Upon being questioned she told how long it would take a man to walk to the sun; how long for an express train to get there; the size of a cylinder of ice that could be driven into it at a certain rate and be converted into steam as fast as it touched the hot surface.

Upon being questioned further she replied, "That is all I can tell. I remember only the things I didn't believe!"

In its broadest sense, Nature Study is a keen, appreciative interest in the common things about us. It means accurate seeing and clear thinking. Nature Study is the most vital idea to-day in education. It is the getting of God's truth at first hand. It is studying things instead of studying about things. Do not call it Elementary Science. The true spirit of Nature Study is opposed to cold, formal study of lifeless things. It is the informal study, for short periods, of things that interest. It opens a new world of delight. Under it, the commonplace becomes transfigured. It shows us how we may get the very best out of life no matter where we are, how to realize the possibilities of happiness that exist even in the most unpleasant environment.—JULIA ELLEN ROGERS in "Among Green Trees."

The Wonderland of childhood must henceforth be sought within the domains of truth. The strange facts of natural history, and the sweet mysteries of flowers and forests, and hills and waters, will profitably take the place of the fairy lore of the past.—JOHN G. WHITTIER.

"For hark! how blithe the throstle sings!
He too, is no mean preacher.
Come forth into the light of things,
Let Nature be your teacher."

—WORDSWORTH.

CHAPTER XII

VICE VERSA

Once upon a time there was a man who read in his newspaper:

"WONDERS IN OTHER WORLDS.
GREAT DISCOVERIES BY ASTRONOMERS
CAN BE SEEN BY AID OF A SMALL TELESCOPE,"
ETC., ETC.

And this man said to himself I will forthwith get me a small telescope that I too may see some of these strange visions before I die. In his eager waiting, the machine arrived. Then the big man, taking his little boy, the box with the long tube and the three legs, hastily proceeded to the back yard.

"Which way does the thing go?" quoth the little boy.

"I don't know; I find no instructions on that point," said the big man, fumbling amidst the packing. "But," he meditated, "I think that little glass is for the little star, and this big glass is

for my two eyes, so far apart." Then he looked at the little star and at the big moon, and slowly said, "They are so very, very, very small."

But the little boy roguishly pulled down the small end and peered through it. "Am I too so very, very small? Why, you are very, very big."

Haec fabula docet, 'tis easy to get things t'other end to.

.

There once was a man (perhaps there has been more than one), who, looking through the big end of the university, said, "I will now view the child in Nature." So he wrote in a book:

"Science teaching for a few years past has been gradually working itself downward from the colleges and high schools into those of lower grades." And realizing that the thing did not work, he proceeds apologetically to state that "In most cases, the plans followed, while fairly well adapted to the demands of advanced pupils, have been poorly fitted to the needs of beginners." So this book (Professor Jackman's "Nature Study") starts out with "the aim to furnish a guide for teachers in the common schools who wish their pupils to pursue an adequate and symmetrical course in Nature Science."

In other words, he pulled out the object glass from "the college and high school" end that seemed to be "poorly fitted," and substituted another in the form of a series of chapters on technical science, diluted and labeled, botany, zoology, chemistry, and mineralogy.

I am not asserting that this is not a helpful book. It is. It has many excellencies, but it is wrong end to, and in this misfortune it is not alone.

But recently a few educators have pulled the telescope sharply around. Probably the most marked and efficient movement has been made by Professor Bailey. Here is his acute *vice versa:*

"Nature study is a revolt from the teaching of mere science in the elementary grades. . . . Nature study is not science. It is not fact. It is spirit. It is concerned with the child's outlook on the world. . . . On the main thesis, that Nature-study teaching is one thing and that science teaching for science's sake is another, I have no hesitation."

Strange that it took so long to realize this fact in nature-study work, and to get the thing *vice versa.* For, after all, it is merely applying to

this branch of education the fundamental principles of general pedagogy. What is claimed for nature study is no exception from what is claimed for other studies. Professor Preston W. Search, in "An Ideal School," puts the same thing in this way:

"There may be virtue of a kind in the class room where the teacher carefully plans all the steps of procedure, and insists on the performance of work according to her ideals; but, in educative worth, it cannot compare with that where the pupil feels the glow which comes from personal discovery and accomplishment. It is a little thing to be an imitator; a great thing to be a creator. The father who insists on his son holding the board while he drives the nail may drive the nail well, but he who holds the board while the son drives the nail does better. The nail may not be so well driven, but he educates his son. Even so in the schoolroom the child must be permitted to do his own work. Dead time must give place to active endeavor. The child must be a discoverer, an originator, a creator. He must be permitted to drive the nail."

This is the same kind of *vice versa*, or trying to hoist the father over to one side of the board, and

to push the son to the other, where he may use the nail. At first thought it seems as if more can be seen by looking into the big glass, but a trial of both ends of the telescope, or better still an understanding of the optical principles involved in its construction, informs which end is the right end. Perhaps, at first thought, and not understanding the child, it may seem that the right way to teach is to begin with a teacher who can tell a great deal. But the more experience you have with the child, the more firmly will you be convinced that this first impression is not the right impression. Begin and continue with him as an original discoverer, so far as you are able, and as far as he will admit of such treatment.

It may, indeed, be quicker for the father to drive all the nails, yet the purpose in pedagogy is not to do the work, but to teach the pupil how to do it. Telling the boy how to swim, or letting him stand on the bank while you swim, will never teach him the art. Let him get into the water and splash and sink. He will gain strength and skill and pleasure every time he goes under and comes spluttering up.

Even if you have made, and enjoyed some original discovery in natural history, do not tell

the boy about it. Do a little of the *vice versa*. Skillfully put him in the way to repeat your observation, if possible. At the very least, let him tell you about some of his own personal observations. You hold the board. He may pound his fingers occasionally. It will toughen them. You rest on the bank while he splashes and sinks. He will soon come up for breath. Never fear for the lad. You have only to keep an eye to him and a hand outstretched, as you keep an eye at the right end of the reversed telescope, and a hand on the focusing adjustment.

CHAPTER XIII

PLANT LIFE

I desire to emphasize both of these words. The teacher should assist the pupil to study and to love plants, not parts of plants, but the plant, root and all. The flower may be the most attractive, but it should not monopolize attention. Rather let it, however beautiful, be an attraction toward the entire personality of the plant.

A sweet and beautiful face wins us, not to the face alone, but to the person, and to the individuality. We love many persons whose countenances are neither beautiful nor sweet, but whose characteristics, whose personal qualities are so sweet and so beautiful, that they seize our affection, because they are so exactly and so mysteriously adapted to fill a vacant place in our own soul. We crave exactly these, and none but these will supply our need. We find such winning characteristics in habits, in kindness of heart, in general culture, and especially in the manifestation of good will toward us. Some persons are so

blessed that they combine all these qualities. So should it be with our love and interest for plants. We are attracted by the bloom of one, by the unique or interesting life history of another, by the method of growth or by the adaptation to its environment of another. We admire still another because it is useful. A well-balanced man is poetical as well as utilitarian. A well-balanced teacher is especially both. But each of these qualities, whether it be beauty of bloom, novelty of growth, utilitarian service, or some other feature, should draw us to the plant as a whole, not to a single bit of its anatomy.

Tennyson was attracted by the flower, but his interest was in the plant. He uses the word flower as a synonym for the entire structure, and there found something more interesting, instructive, and important than beauty only, however valuable beauty may be, and its beauty is indescribable and immeasurable.

> "Flower in the crannied wall,
> I pluck you out of the crannies,
> Hold you here, root and all, in my hand,
> Little flower, but if I could understand
> What you are, root and all, and all in all,
> I should know what God and man is."

That is the right spirit for nature study in

teacher or pupil, a desire led from the flower at first uppermost in mind, to a greater interest, which is, or should be, to know the whole, "root and all." I fear that many of us make the mistake of saying in action, if not in words:

> Flower in the crannied wall,
> I pluck you from the crannies,
> Pull to pieces all your parts, in my hand,
> Little flower, but if I could understand
> Pistils, stamens, and pollen, all in all,
> I should know what botany is.

I can see no better reason, at least in the teaching of young children, for administering doses of the biology of sex, and of histology diluted, than for teaching the same things regarding animals. The study of sex, and of basic life-functions, should be postponed till we reach science in the higher grades in the high-school or college. There is enough to see and to study in those grades where the nature study phases of the plant are introduced; that is, in getting acquainted with the plant as a whole, from seed to maturity. How to know the wild flowers is good; how to know plants is vastly better.

Let me now emphasize the second word in my title. Our knowledge and our love of plants are

poorly manifested by chasing them over hill and into forest, down the ravine, through the meadow and across the swamp, in killing them, drying them, pressing them, sticking them on paper, poisoning them, and last, but not least, by hurling jaw-breaking polysyllabic Latinized names at them. Better let us know them as living things. The child who *cares* for pets, loves them better than the taxidermist who kills them, stuffs them, and sells them for an advertisement in a saloon, or in the window of a cheap restaurant. Cultivate in the young folks, then, the nourishing, caring love of living plants. Better one plant grown from seed to maturity, and watched in all its stages, than a hundred mummified in an herbarium. Have you seen the sprouting (no, I don't mean peas and beans, too often with a few tadpoles and a cocoon or two, the all-embracing synonym of nature study), but have you really seen the first steps in the life of the daisies, wild carrot, "butter-and eggs," tick trefoils, acorns, all easily gathered on a "thousand hills," and all easily germinated? Why is it that we commonly study seeds from the garden in early spring, and then go to the wild flowers of the field in May and June? Would it not have been better to begin with the

seeds of the wild plants, or to continue with the growing plants of the garden?

Beans and peas are germinated in many schools, but in few are they grown to maturity, or brought from home gardens, so that the flower and the bud may be admired as buttercups and daisies are adored. I protest that it is illogical to begin in May with peas and beans, jump in June to wild flowers, and land in the autumn on tick trefoils, stick-tights, and chestnut burrs. It is confusing. Let us know one plant thoroughly, if we have no time to do more. Let us know the sprouting chestnut and the bean pod, let us know the dandelion and the milkweed seeds, sprouting as well as floating with a puff, puff in mid air. Of course, they are pretty, and the children do not need to be told that they are, nor to have the floating seeds blown about the schoolroom. Too often such an illustration of a well-known fact makes the teacher ridiculous.

Feed the same growing plants on different soils, and different plants on the same soil, and note results. Let them grow in sunshine and in shade, even in darkness. Let them grow from the dark toward the light. Let us have also aquatic plants, submerged and floating plants.

Let us have common plants, and more glorifying of the commonplace, more of the spirit of Rennie, the naturalist:

"It can never be too strongly impressed upon a mind anxious for the acquisition of knowledge, that *the commonest things* by which we are surrounded are deserving of minute and careful attention."

If there is not room for all, set aside the geranium, and substitute a squash vine; set aside the calla, and substitute a beet; a turnip is as interesting and a good deal more important than a fuschia. There is much wisdom wrapped up in a cabbage head, provided it comes from the field.

Keep in mind that the object is to make the child not a botanist, but a lover of natural beauty, to develop his capacity to appreciate Nature's commonplace things. As Professor Bailey puts it:

"The happiness of the ignorant man is largely the thoughts born of physical pleasure; that of the educated man is the thoughts born of intellectual pleasures. One may find comradeship in a groggery, the other may find it in a dandelion; and inasmuch as there are more dandelions than groggeries in most communities, the educated man has the greater chance of happiness.

"If one is to be happy, he must be in sympathy with common things. He must live in harmony with his environment. One cannot be happy yonder nor to-morrow; he is happy here and now, or never. Our stock of knowledge of common

things should be great. Few of us can travel. We must know the things at home."

Study these common plants of the garden and of the field, in the schoolroom as well as in their natural habitat. Then do not look down so often that you fail to note the glorious things above and the grand plants in the forest. Note the struggle for existence in the shrubs and tangled undergrowth on the borders of the meadows and in the swamps. In the forest you may see the victors that have fought successfully with their rivals of long ago, and now have the field pretty completely to themselves. Thus viewed, the plants become sentient things. We discover life in them, and love them.

"The nature study that is true to child life must first of all afford free scope to the passion for activity and guide this toward wholesome channels. It should at the same time infuse life and spontaneity into school work, and so lighten rather than increase the task of the teacher."

PROF. CLIFTON F. HODGE.

"Nature Study should lead to a sympathetic acquaintance with living plants and animals in their natural environment."—A. C. BOYDEN.

"This introductory relationship with Nature is a resource of inexhaustible delight and enrichment; to establish it ought to be as much a part of every education as the teaching of the rudiments of formal knowledge; and it ought to be as great a reproach to a man not to be able to read the open pages of the world about him as not to be able to read the open page of the book before him. It is a matter of instinct with a few; it may be a matter of education with all. Even those who are born with the eyes and ears of naturalists must reinforce their native aptitude by training."—HAMILTON WRIGHT MABIE.

"Is there anything more delightful than the fatigue of a summer afternoon's long ramble after objects one loves? You are not tired of them, but *with* them. It is a delicious fatigue. Subsequent years of trouble cannot obliterate the charmed impressions. They are the sunniest spots in one's memory. Their recollections come, like angels' visits, to unconsciously relieve us in after-years of many a sad trouble and trial. They should be laid up in store when you are young, so that they can be drawn upon when you are old. Then the sunshine of youth is stored to gild the troubled days of matured manhood and the darker shadows of old age."—DR. J. E. TAYLOR, in "The Playtime Naturalist."

CHAPTER XIV

SCHOOL GARDENS

Plants need food, not necessarily earth, because earth is merely the matrix that contains the food in a more or less extended form. The rootlets of the plant will explore every tiny space about and among the particles of soil for a bit of nutriment in solution.

I never see a rootlet or a root-hair without thinking of the proboscides of honey bees. The bee explores many a flower for a drop of nectar. She gathers from all sources, till by her efforts, combined with those of thousands of others, sufficient food is provided for the entire colony. As each bee explores the flowers of a certain territory, gathering the greater portion of the nectar within that region, so each root-hair searches over, around, under, its small domain of perhaps a dozen microscopic granules, or within its little mass of partly decayed vegetable mould, each working in co-operation with legions of others, so that the entire plant is provided with sustenance, as the bees

working in company collect for the whole swarm. This is the natural method of gathering honey. To understand it fully, the work of a swarm should be actually seen. But to enable us to make a careful study of their actions, it is not really necessary for the bees to collect the nectar in the manner ordained by nature. They may be artificially fed.

So in studying plants, it is well to know at least a few as they grow in the soil, whether in the field, the garden, or a box of earth. But, fortunately, it is not necessary that all our investigations should be made in this manner. The method can be adapted to the materials at hand in the country; indeed, the young people's study of plants should be mostly of those in their natural environments, with a few artificially fed, so as to bring the entire organism under immediate and close inspection.

The conditions are reversed for the city child. He has few opportunities for access to plants in their native places, limited as he is to the trees and shrubs in the public park, or to those seen on an occasional visit in the country. Here enters the special advantage of artificial culture.

As has been said, the plant does not want the

earth, since it absorbs the inorganic matters which it needs for its food, as they percolate in solution through the soil. The student of inorganic chemistry knows what these are, and that they may be supplied to the plant under investigation, without the intervention of the soil. All that is needed is some material, be it sawdust, pebbles, shot, beads, or any other substance through which the roots may pass, to seek the food artificially applied to this artificial soil. As honey may be purchased in the market, and supplied to the bees by spreading it on almost any convenient material, so that they may have easy access to it, so this chemically isolated nutriment may be manufactured in a form convenient for solution in the water which is poured over the substance that upholds the plant and gives the rootlets easy access to their food supply.

Several botanical chemists have provided such food. Perhaps the best is that made according to the following formula by Professor Sachs, and pressed into tablets for the sake of convenience. Each of these tablets is composed of the following:

	Metric weight (nearly)
Common table salt (Sodium chloride, NaCl), 2 grains.	.162 grams.
Plaster of Paris—Gypsum (Calcium sulphate, CaSO 4), 2 grains.	.162 grams.

Epsom salts (Magnesium sulphate, $MgSO_4$),
2 grains. .162 grams.
Phosphate of lime, nearly the same as burned bones.
(Calcium phosphate, $Ca_3(PO_4)_2$,
2 grains. .162 grams.
East India saltpetre—Nitre (Potassium nitrate, KNO_3),
5 grains. .325 grams.
Compound of iron and chlorine (Ferric chloride, $FeCl_3$),
nearly 1-10 grain.

To make the food solution, two tablets are required for each pint (500 ccm nearly) of water. Crush them, and be sure that they are entirely dissolved, and always shake the solution before using it. Keep the plants thoroughly moistened with this, and it will supply them with both food and drink.

This is well known in all botanical laboratories. It makes an ideal food for our common plants, and the device solves the problem of school gardens in which little soil can be used. Let the seeds germinate in warm, moist air supplied in any convenient manner, the most convenient perhaps being wet cotton batting. Let the plant grow on mosquito netting stretched across the top of a tumbler, or other receptacle full of the solution, or in sawdust, pebbles, or in almost any convenient material kept wet with it. A luxurious crop may be grown in brick-dust, or in an old tomato can, or in a bowl filled with sand or with pulverized stone from a macadamized road. All you need is a receptacle for the material through which the

roots may penetrate in darkness. You supply the food and nature does the rest. If the growth is on a net stretched across a transparent vessel containing only the liquid, with no opaque objects among which the roots may naturally shun the light, heavy paper or black cloth should be wrapped around the glass, the wrapper to be removed whenever it is desired to examine the plant.

Children like novelty. By this artificial feeding there is no limit to the novelty. A cup-like depression may be chipped in the side of a brick, and the fragments put back into the hole. Place the brick on a plate, supply the food, and germinate the seed on the chippings. The bits of brick hold the plant and you feed it.

A cloth may be stretched between two supports, and the nutrient solution applied by allowing it to drip through a hole in the bottom of a suspended can. The plants may be grown on this cloth like epiphytes. It is not absolutely necessary that the roots be kept in darkness, but growth is hastened and improved, by placing a box with openings so arranged that the plant may be in the light and the roots in the dark.

The roots are almost seen to grow. The appearance of new root hairs is looked for eagerly.

The writer has experimented with these food-tablets in a great variety of methods and always with success. They are used in the university and in the kindergarten. The technical botanist appreciates their convenience, and the youngest child, mixing a little sawdust in a teacup and growing a few plants in it, finds entertainment and instruction.

Plants may also be easily grown without even a shelf or a table. All that is needed is a wide-mouthed bottle, filled with pebbles. Climbing plants may thus be easily trained around the window, from jars hanging at the side of the frame.

When large plants are growing in small vessels, I am often asked, "Where are the roots?" The only explanation that I can offer is, that under this artificial feeding the plants seem to require the roots to be few and short. I have grown at least a dozen plants to a height of more than two feet from sawdust held in two-thirds of an egg shell.

CHAPTER XV

THE MICROSCOPE IN NATURE STUDY

No one who possesses a pocket-microscope of even the most limited powers can fail to find amusement and instruction even though he were in the midst of the Sahara itself. There is this great advantage in the microscope, that no one need feel in want of objects as long as he possesses his instrument and a sufficiency of light.—Rev. J. G. Wood.

If normal eyesight is so valuable that even a slight defect promptly brings forth efforts to remedy it, then why do we not hail with joy the aid of even a small microscope, that will add so greatly to our capacity of seeing? The microscope is not an occult instrument of a special science, necessitating a knowledge of that science in order to appreciate the instrument. It is true that the microscope is used extensively in scientific work, and this fact is so generally accepted that the statement, at least in popular thought, seems to prove too much, since the instrument is believed to be inseparable from the science. But the microscope is in itself nothing but an instrument with which to see. This is as true of optical aids for

viewing distant objects. The Yerkes telescope, or an opera-glass used to view the skies, is nothing more nor less than seeing; it is another set of eyes, if you please, with which to peer into the infinitely great and distant world; and to use the microscope is to see into an equally wonderful, but infinitely minute creation. As the reader now knows, nature study, in its school sense, is informal observation of nature. When we synthesize, classify, and note details carefully, our observations are scientific. Of the same objects we may thus have with the unaided sight, either nature-study or science. The seeing is not made science by optical aid, but by our purpose and the standpoint from which we view the objects. You do not think it necessary to be an astronomer in order to look up and enjoy the beauty of the glittering stars. No one regards John Burroughs as an astronomer deeply versed in that science, and yet no one has expressed better than he this nature-study phase of celestial seeing:

"How often do we really see the stars? Probably a great many people never see them at all, that is never look upon them with any thrill of emotion. If I see them a few times a year, I think myself in luck. If I deliberately go out to see them, I am quite sure to miss them; but occasionally, as one glances up to them in his lonely night walk, the mind

opens or the heavens open—which is it?—and he has a momentary glimpse of their ineffable splendor and significance. How overwhelming, how awe-inspiring! His thought goes like a lightning flash into that serene abyss, and then the veil is drawn again."

That is nature-study star-gazing, the pleasures of seeing, simply seeing without science, so far as unaided sight will extend, but because the eye has the aid of a 40-inch refractor, or of only an opera-glass, it does not for a moment follow that there may not be the same enjoyable emotions. The lens does not make science, but its method of use does. Nowadays, no plea is needed for the use of the microscope in scientific seeing. In the biological sciences it is indispensable and universal, so universal that I fear its use is erroneously regarded as necessarily scientific. But the microscope is merely an instrument for aiding the sight. What a vast amount of knowledge comes to unaided eyes from scientific seeing. But even this is only a small amount in comparison with the pleasure that comes to unaided eyes from informal seeing, the nature-study use of them. Would all your informal nature-study seers for one moment think of allowing all eyes to be used only for systematic, scientific seeing? I think not, most decidedly not. The very proposition appeals to one,

not as an argument or enticement, but as an absurdity. Equally absurd is your relinquishing to the scientists all use of the microscope. Just about as absurd as it would be to let the scientific ornithologist in the fields have the sole right to use opera-glasses. You recognize their value to him in their scientific use, but you are not willing that he should monopolize them. You rightly continue their use for pleasurable seeing. The scientist derives both pleasure and scientific knowledge from their employment. Even if you do not care for the science, continue their use for the pleasure. As soon abandon the gratification of unaided seeing, as to forego the pleasure of such magnificent pictures as are obtained by the use of the microscope.

You notice the attractive foliage and graceful outlines of the tree, and your heart is warmed by the sight; it dilates in appreciation of the beauty, and, if you rightly consider the subject, your experience increases your ability to observe better at the next trial. As was previously stated, let there be but some defect in the eyesight, and then how we strive to remedy it. The clouds, the trees, the green grass, the variegated flowers, the birds, familiar forms and faces, are all sealed to

the blind, but you, who know not the delights of a microscope, are suffering from exactly the same misfortune, for you, too, are blind. You see that tree and its foliage, but the microscopist sees the structure of the mosses, lichens, and tiny algæ that ornament the trees. You exclaim over the scarlet tanager that is flitting about in the topmost branches. What a pleasure to you and what a loss to the blind man! But the microscopist says, "I have seen the wonderful structure, and learned the interesting habits of the aphides and leaf miners," although his use of the microscope may have been as unskillful as your use of your unaided eyes. You have lost in relation to him exactly the same in quality if not in quantity as the blind man has lost in his relation to you. Strange, is it not, that so many are microscopically blind? and the pitiable phase of it is, that the victims are ignorant of their loss. In this sense, the use of high-power lenses and of showy instruments is not a guarantee against microscopical blindness. Sometimes "the heavens open" in the infinitely near world after years of microscopical skill. But that is another matter.

What I would especially impress upon teach-

ers, are the pleasures of observing, and especially the importance of observing as much as possible. If you have missed the charms of even a pocket microscope, you have to that extent been pitiably blind. It is not, as too often believed, the loss of a certain science in which you maintain that you are not interested, and which you do not care to understand, but a loss of pleasurable seeing, which you can only appreciate when you begin to learn what you have been for so long losing. "Having eyes yet seeing not:" telescopically and microscopically blind to all but a small part of the delights of "both great and small." I extend to you, not alms in your blindness, but a sincere appeal for a self-cure. Get at least a simple pocket-microscope, and apply it as persistently as possible to seeing eyes that they may see more. Having done that, see some more, and more. We learn to see by intelligently seeing, not by merely looking.

And what a beautiful world is this, for seeing things. The Infinite does not know how to make a better. He pronounced this one "good." He has given us His best. Shall we be lacking in appreciation through indifference? Let us see everything possible with our unaided eyes, and

get a microscope and use it faithfully that we may see more, and, let me repeat, still more.

Then, when you have faithfully used this wonder-working instrument, used it with the mental labor and diligence demanded for well doing in anything worth doing at all, used it in freedom from the "constitutional weariness" so common in all pursuits except that of money-getting, then will you appreciate what Gosse, a pleasure-seeing as well as scientific microscopist, has affirmed :—

"Great and gorgeous as is the display of Divine power and wisdom in the things that are seen of all, it may safely be affirmed that a far more extensive prospect of these glories lay unheeded and unknown till the optician's art revealed it. Like the work of some mighty genie of Oriental fable, the brazen tube is the key that unlocks a world of wonder and beauty before invisible, which one who has once gazed upon it can never forget, and never cease to admire."

"Nature Study aims to cultivate in the child what may be termed the elementary equivalent of the genuine scientific spirit, so that out of his nature fondness for things about him shall come an enthusiastic, truth-seeking, reverent attitude toward nature, with boldness to question her, patience to study her, and readiness to be taught by her."—A. C. BOYDEN.

"As the child understands his own environment he is prepared to appreciate geography as the study of the home of man. The thoughts of the life throbbing through the plant and animal, and of the forces at work about us, all in perfect harmony, and for definite purposes, are suggestions of infinite law."—A. C. BOYDEN.

"There are two forms of Autumn: there is the misty and dreamy autumn: there is the vivid and brilliant autumn: almost the difference between the two sexes. The very word autumn is both masculine and feminine. Has not every season, in some fashion, its two sexes? Has it not its minor and major key, its two sides of light and shadow, gentleness and force perhaps. All that is perfect is double; each face has two profiles, each coin two sides. The scarlet autumn stands for vigorous activity: the gray autumn for meditative feeling. The one is expansive and overflowing; the other still and withdrawn. Yesterday our thoughts were with the dead. To-day we are celebrating the vintage."—AMIEL'S JOURNAL.

CHAPTER XVI

NATURE STUDY IN THE AUTUMN

Special prominence should be given to nature study in the last two weeks of September and all of October. Full-grown plants, flowers, fruit, and an almost infinite variety of insects may be obtained. The four-footed animals are busily interesting. Aside from the birds (to which chief attention is usually given in May and June), all outdoor interests are now at their best.

During September, the schools have resumed their usual regularity of exercises; the warm weather still continues, with a clearness of air that makes one grateful for the pleasure of mere existence; the young folks retain the enthusiasm of the experiences during the long vacation, and they still have the accumulated wealth of outdoor spirits.

By way of contrast, the newness and awakening of spring, the bursting of buds, the germination of seeds, the growth of the early spring flowers, and the coming of the birds, it may be maintained,

have charms and advantages excelling those of autumn even at her best. It must be admitted that the outdoor attractions of spring are many, but at that time their availability is somewhat lessened by the examinations, the approaching end of the school year and the eager anticipations of the long vacation.

It is easy to advance arguments for the superiority of any of the seasons for nature interests. They are all good, all best, the best of the good things of life. As Sir John Lubbock has said: "Happy, indeed, is the naturalist; to him the seasons come round like old friends; to him the birds sing as he walks along, the flowers stretch out from the hedges, or look up from the ground; and as each year fades away, he looks back on a fresh store of happy memories. Every month has its own charms and beauty."

But taking all things into consideration, it seems to me that after a short time for the readjustment of the affairs of the schoolroom, there should be at least six weeks for rich harvesting of outdoor knowledge, a gathering of a store of happy memories for the coming winter.

How attractive now is everything in its perfection of life and beauty; how exhilarating the

delicate mingling of warmth and cold, the sunshine and the showers! The clear day holds the essence of the previous rain in every breeze. As Dr. Abbott has so truly expressed it: "There is a beady sparkle in every breath we draw, a sane intoxication in every lungful of the October breeze There is never a lack of good company when October sunshine and frosty autumn winds meet upon the meadows. He who goes there at such a time with a clear conscience, will return better fitted to meet all of life's vexations. For the old man it is a cure for pessimistic thought; for the youth it is a safeguard against distorted views of life. Nature is then rejoicing, why should not we?"

And the things that we thoroughly enjoy in nature reciprocate in benefits to us. We go to her with our best, and her best is given freely to us. "Nature is loved by the best that is in us."

"For him who has the eye to see it, beauty, like thought, has an intrinsic right to a place among the realities of the world. He who demands to know why our children should be trained to an appreciation of the beautiful only proves by his question that he does not know what beauty is, that it is to him a mere name."

"In order to perform it, the school must rid its pupils of what Plato called the lie in the soul, self-deception, as to the ultimate goods of life. It must make them realize that not in their wealth, not in their social position, not in their reputation, but in themselves is to be found that which makes life a success or a failure."

"Every way I was happy, as idler, as painter, as poet. Forgotten impressions of childhood and youth came back to me—all those indescribable effects wrought by color, shadow, sunlight, green hedges, and songs of birds upon the soul just opening to poetry. I became again young, wondering and simple, as candor and ignorance are simple. I abandoned myself to life and to nature, and they cradled me with an infinite gentleness. To open one's heart in purity to this ever pure nature, to allow this immortal life of things to penetrate into one's soul, is at the same time to listen to the voice of God. Sensation may be a prayer, and self-abandonment an act of devotion."—AMIEL'S JOURNAL.

CHAPTER XVII

A PLEA FOR WALKING

In our outings the means as well as the end has value; the getting there as well as the things obtained or seen or studied. Let us, then, regard walking as a nature-study subject.

Diversified as is nature, so is the variety of her lovers' devotion. Her every phase has an admirer, from the largest to the smallest, from the most conspicuous to the least noticed, and from the most beautiful to the things called unattractive by those who do not love them.

St. Paul, writing of spiritual gifts, says:

"Now there are diversities of gifts, but the same spirit.

"And there are differences of administrations, but the same Lord.

"And there are diversities of operations, but it is the same God which worketh all in all.

"But the manifestation of the Spirit is given to every man to profit withal. . . .

"But all these worketh that one and selfsame Spirit, dividing to every man severally as he will."

So in all the diversities of interests in the natural world there should be one spirit, that of walking. Indeed, I am so strongly convinced of this that I sometimes think there is but one thing, one gift, the ability to walk, and that all other matters are diversities of pretexts, excuses for going out to walk.

The sportsman carries gun and game bag; the fisherman fishing rod and tackle; the naturalist camera and collecting box; each has an all-day's tramp and comes home with but little to show for miles of walking. Tired out? Discouraged? Regretting the trip? Yes, tired out, yes, and tired with them, but not of them, but happy, even jubilant, and with full determination to go again as soon as possible. Was that one squirrel, one trout, one photograph, one specimen worth all the time and labor? If it was not, then we may well expect discouragement and regret. But these visible trifles were only souvenirs of the real thing, the walk. That was obtained in all its fullness, and that was happiness and an inspiration for another similar journey. Never mind the little excuses. Now that the real thing has been obtained in such fullness, the excuses are forgotten.

The Rev. Dallas Lore Sharp is delightfully

confidential and candid in exposing the mycologist's real motif.

"And the collecting of mushrooms is, after all, their real value. Our stomachs are too much with us. It is well enough to beguile ourselves with large talk of rare flavors, high per cents of proteids, and small butcher's bills; but it is mostly talk. It gives a practical, businesslike complexion to our interest and excursions; it backs up our accusing consciences at the silly waste of time, with a show of thrift and economy; but here mushroom economy ends. There is about as much in it as there is of cheese in the moon. No doubt tons and tons of this vegetable meat go to waste every day in the woods and fields, just as the mycologists say; nevertheless, according to my experience, it is safer and cheaper to board at a first-class hotel, than in the wilderness upon this manna, bounty of the sky though it be.

"It is *the hunt* for mushrooms, the introduction through their door into a new and wondrous room of the out-of-doors, that makes mycology *worthy* and *moral.* The genuine lover of the out-of-doors, having filled his basket with fungi, always forces his day's gleanings upon the least resisting member of the party before he reaches home, while

he himself feeds upon the excitement of the hunt, the happy mental rest, the sunshine of the fields, and the flavor of the woods."

The more I observe my fellow enthusiasts in other departments of nature the more firmly am I convinced that this assertion applies equally well to them, and in full force, too.

Go on, happy mortal, in your innocent delusion. Dream of your diatoms, birds, snakes or boulders. They are only agents to entice you to the real thing, walking and its accompaniments. It is the accompaniments that give it the charm. These are not the minutiæ of nature magnified into importance, nor yet the larger interests hampered within the folds of scientific environments. But you will, O scientist, artist, photographer, not go into the fields only to rake up the straws, but to look at the real things. Your soul will and does drink in the influence of things. You will walk in this paradise, and be happy, though perhaps you may be ignorant of the reason.

What a boon is walking to every child and youth. It is not only in our infancy that heaven lies about us, but through our youth. In the merry rambles of childhood, we get near to this paradise. It may be that later, as Colonel Thomas

Wentworth Higginson has said, "We strive to picture heaven, when we are barely at the threshold of the inconceivable beauty of earth." If so, it is then that a walk abroad restores us to the heaven of childhood and of youth. All the senses combine to suggest and restore perpetual youth. Walking is the storing of priceless wealth for maturity and old age. It is the link connecting with things eternal, not the eternal things promised in some distant future, but the eternal, priceless things of the present. It gives health of body and wealth of soul, enjoyable for the present and stored for the future.

Walking in the full strength of maturity! Is there any other luxury that can equal it? It puts all earth beneath us and heaven around and above. No toiling horse shall drag us, no freaky bicycle claim our undivided attention, no smoky locomotive shall pull our car, rank with the odor of varnish, except when we cannot have what nature intends us to have, the glorious privilege of walking. Walking brings into play every muscle. It fills the lungs with pure air and the arteries with rich blood. It restores us to ourselves. It gives independence. We do as we please. It may be to saunter leisurely along this road, to climb that

fence and go down that picturesque path, to rest by the spring, to worship in the forest, to hear the music of the brook, to discover primeval dells and grottos, these are some of the rewards of walking. It takes us to scenes that no vehicle can reach; it gives us wealth which no money can buy.

"Light-hearted to take to the open road,"

and in firm strides go to the top of that hill. There we look across the valley. And Paradise lies over yonder in the blue distance. We rejoice in the possession of vast territory that is ours, for the mere walking to it.

And so we walk on to gain the riches of yonder forest, and still farther on. But even the best is limited in extent, yet the riches of the territory to be obtained by walking are limitless. We find that the distant place, when reached, is no better than that we have left behind. We learn that the actual wealth is not to be obtained by rapid walking but by leisurely sauntering, by making the most of the present. Not least among the values of walking is the lesson of contentment. It is this place, this day, this world here and now, that we are to know, and in which we are so to

live that it may become to us a paradise. Even if there is a better and greater, how shall we comprehend it if we cannot apprehend this? Let us learn to walk well in the paradise which we now possess. Let us heed the great Teacher with whose walks were interwoven lessons from the fields, whose entire ministry was peripatetic. Let no more Beloved Disciple lament, that "from that time many of his disciples went back, and walked no more with him." But rather,

"He that saith he abideth in him ought himself so to walk, even as he walked."

"Even so we also should walk in newness of life."

Ever new. Ever a walker. The thought of the walk spiritualizes the walk, and that kind of walk spiritualizes the walker.

And every nature-study teacher, every nature-study pupil should be a walker. The ability to walk, to get enjoyment from it as well as knowledge from the things seen, is worth more to teacher or pupil than to find out what is inside of a caterpillar, or how many rings there are in the abdomen of a dragon-fly.

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"Nature Study is studying nature, in its own environment by the natural method, through the self-activity of the child.

"When Nature Study is directed, as by our teachers, the child is impressed with the fact that in order to make the knowledge brought to him through the senses serve him in the best possible way he must train himself to so judge this knowledge, to so compare it and to so arrange it in his mind as to be ready to use it in different forms of thought expression, drawing, modelling, speaking, writing, or to turn it to practical account in the affairs of his life." —MATTIE ROSE CRAWFORD, author of "Guide to Nature Study."

"If nature is to be a resource in a man's life, one's relation to her must not be too exact and formal, but more that of a lover and friend."—JOHN BURROUGHS.

"It is one of the laws of our being that by seeking interests rather than by seeking pleasures we can best encounter the gloom of life."—LECKY.

CHAPTER XVIII

OUTINGS

"How many pupils do you usually take with you on your outings?" recently inquired a school superintendent.

"I most usually don't take any," was my reply.

"Don't take any with you!" he exclaimed. "Why, I thought you conducted parties of school children on natural history excursions?"

"So, indeed, I do," I replied; "but if I didn't have a love of nature that would take me out alone into the fields and forests many, many times to once that I go with a natural-history party, I am confident that I should not have sufficient love of my own for nature to inspire any of it in others."

And I went on to say to him, as I now say to you, that you cannot give to others what you yourself do not possess. The first essential is to get into harmony with the infinite, into loving intimacy with nature, so that through your influence a responsive chord may be set into vibration within

the hearts of your companions; or, to revert to the other figure, you may introduce your companions to your loving Mother Nature when you know and love her so well yourself that you may in the introduction transfer some of that knowledge and affection to your friends. Therefore you must "usually" go alone; then when you go with others you will have something genuine to transfer, and not merely a perfunctory task to perform. Nature should be so resourceful to every teacher of nature study, that he could go and live with her for days and weeks, until the longer he stayed the longer he would like to stay.

A superintendent of the schools in one of the largest cities in New Jersey said to me: "I don't know what is the trouble with nature study in our schools. We have tried it, and the children don't seem to be much interested in it. We devote fifteen minutes a day regularly to it, and I often have my doubts whether it is worth while to assign even that small amount of time."

I was puzzled.

Later, in a conversation regarding other matters, he jokingly referred to a visit which some of the teachers had made in the Adirondacks. A club went up there to stay for four weeks. They came

home at the end of two, reporting that it was the dullest place they had ever seen.

My puzzle was solved.

That reminds me of a story that I have somewhere read. A wealthy business man had sent his wife and children to their country home. He spent the week in the city at his business office. One day, as he thought of the inequalities of fortune, he said to himself,—"Isn't it strange that my family can have so much, when there are so many women and children that must toil all the week in the hot city, and have none of the joys of country life. If I were the ruler of the universe, I would have things different. Come to think of it, although I can't rule the universe, I can remedy a part of this injustice. I will send a part of these women with their children to a boarding-house near my own country home."

So he had his secretary make the arrangements, and a party of seven washerwomen and twenty-three children were sent to the country. Then as the man toiled at his desk, he was the happier, not only in anticipating his own weekly visit to the country, but in feeling that he was giving much pleasure to those thirty poor persons. Imagine his amazement when, at the end of the first

week, he received a letter from the country, stating that the entire company had deserted and returned to the city. He waited for no secretary to transact this business. He grabbed hat and cane and started for the East Side, to search for, and find, too, the woman who had been prominent in organizing the party. She came to the door, wiping her hands on her apron. He inquired as to the board, the location, and the treatment of the children. All these had been satisfactory. Finally, almost in exasperation he said, "Tell me, madam, frankly, why did you come home? Doesn't my kindness to you merit at least some candor on your part?"

"Yes, sir, it does; you're a good man. I tell you, sir, we all came home because there was nothin' doin'!"

I have read of a similar experience on the part of a Boston lady, who, upon investigation, found that a poor woman whom she had sent to the country had come home, because she "liked people better than stumps!"

And yet, absurd as are these excuses from these uncultured persons, it is to be feared that they have far too many followers who everlastingly want to be where there is "somethin' doin'," or

where there are greater aggregations of people, rather than in the land of stumps and trees, fields and brooks, flowers and birds. It is only the greatest teachers and poets, and the greatest souls, that seek the wilderness and the mountains, to find strength and comfort. It is ever true that outdoor life must be a pleasure to the teacher first, before that teacher can make it a power to benefit others. First of all, then, go alone, and make it to yourself what you would have it be to others.

> "Nature ever yields reward
> To him who seeks, and loves her best."

And this seeking and loving must be done in all seasons, and in the rain as well as in the sunshine. Nature exists in the winter, in the snow storm and the rain, and even at night. Know nature; woo her even under difficulties; you will appreciate her all the more. Take the young folks with you to find and admire icicles and snow crusts; do not look for daisies and scarlet tanagers only. Is there anything more beautiful than the lace-fringed brook in winter?

Lowell's love of nature was not limited to spring and summer. He found joy in the winter:

"For my own part, I think Winter a pretty

wide-awake old boy, and his bluff sincerity and hearty ways are more congenial to my mood, and more wholesome for me than any charms of which his rivals are capable. . . . However, when you do get a crust that will bear, and know any brooklet that runs down a hillside, be sure to go and take a look at him, especially if your crust is due, as it commonly is, to a cold snap following eagerly on a thaw. You will never find him so cheerful. As he shrank away after the last thaw, he built for himself the most exquisite caverns of ice to run through, if not 'measureless to man' like those of Alpha, the sacred river, yet perhaps more pleasing for their narrowness than those for their grandeur. What a cunning silversmith is Frost! The rarest workmanship of Delhi or Genoa copies him but clumsily as if the fingers of all other artists were thumbs. Fernwork and lacework and filagree in endless variety, and under it all the water tinkles like a distant guitar, or drums like a tambourine, or gurgles like the tokay of an anchorite's dream. Beyond doubt there is a fairy procession marching along those frail arcades and translucent corridors."

> "Their oaten pipes blow wondrous shrill,
> The hemlock small blow clear."

Then what infinite variety in the snow crystals; what marvelous silky beauty in the blocks of "frost coming out of the ground;" what delicate traceries on the lower side of the ice from beneath which the water has dried away; what exquisite tapering outlines of the leafless twigs against the background of the cold, blue sky!

Birds now are to be observed, but they do not confuse by their numbers. Winter birds seem to say, We are worth your careful study, therefore there are few of us.

Go frequently to the winter fields and woods, to the marshes, and into the mazes of the swamps where you cannot so easily go in summer; go to see things, and for the sake of long walks; go alone and with companions; in sunshine and in storm; go with that elasticity of step, that joy of heart and brightness of eye that only winter can produce.

Then go again.

"For many years it has been one of my most constant regrets that no schoolmaster of mine had a knowledge of natural history, so far at least as to have taught me the grasses that grow by the wayside, and the little winged and wingless neighbors that are continually meeting me with salutations which I cannot answer, as things are. Why did not somebody teach me the constellations, too, and make me at home in the starry heavens which are always overhead, and which I do not half know to this day."—THOMAS CARLYLE.

"The true naturalist is a true poet. Into his mind the influences of natural scenery, of natural history, unconsciously sink down. There is an unmentionable bliss in the unrecognized sympathy which goeth forth toward all things into which He hath breathed the breath of life. The scent of the opening buds; the sad, soft sighing of summer winds; the unobtruding kaleidoscope of floral form and color, scattered so freely and bountifully; cannot these get hold of the soul of a man! One feels constrained to adopt the language of the principal talker among the favorite disciples—'Lord, let us build three tabernacles,' etc. The disciple was in no hurry to depart."—DR. J. E. TAYLOR, in "The Playtime Naturalist."

CHAPTER XIX.

GIVE THE YOUNG OBSERVERS A CHOICE

Nature study should be spontaneous on the part of the pupil. To most pupils nature study is a privilege and a pleasure. To these it is a very simple matter to make it a tonic and not a task.

But the problem comes when we regard the few who do not regard it as a privilege or a pleasure, and the few larger pupils in the class who, perchance, may regard the bringing in of specimens or the telling about them as "kiddish" as I once heard a boy express it.

If there is a certain period assigned to nature study, shall this period be merely one of laziness or indifference on the part of these few? That is a question that often confronts a teacher. Or shall certain pupils be allowed to hold entirely aloof from the informal work, even if there is not a definite nature-study period?

It is true that nature study should be a pleasure, and it is a pleasure to most pupils, but this does not annul the fact that it should be required.

To attain both ends, I have found it convenient to make a threefold assignment, from which a choice may be taken :

1. Bringing in a specimen and telling where it was obtained, with statement of any interesting facts connected with it.

2. A story of entertaining truths that I have seen, read or been told, about natural objects.

3. Assignment of some topic to be investigated from books or other sources of information. Thus, for example, asbestos has been for the past weeks a timely topic, because it has been referred to so frequently in the newspapers in connection with theater curtains, since the fire that caused so great a loss of life in the Chicago theater. Radium is another good topic. The pupils should tell what they have read or heard regarding this wonderful metal. The teacher corrects any wrong impressions that the children may have acquired, and states any facts of interest she may have readily obtained from the many popular articles in various periodicals.

By this method of choice in nature-study work or interests, the pupils have no odious task to perform, neither is the period one of shirking, nor an exhibition of laziness on the part of a few.

CHAPTER XX

PROGRESS BY AVOIDING REPETITION

(*Extracts from a letter.*)

Whole classes are taken out on clear days to the woods, fields, stream, hillsides, and gorges to observe and enjoy Nature. When out on these rambles they collect various things of interest and bring them back for further study.

In this study we aim to connect it with other studies in such a way as to give added life and meaning to them. These excursions, wheat, corn, trees, etc., are made the themes for compositions. Thus we give the children something to write about that they have seen and experienced—the only theme that a child can tell of intelligently. Nature poems are learned and recited in connection with the objects studied. Nature songs are sung in school. These compositions written by the children are neatly written out and kept in a composition book. The books are passed on from grade to grade each year, so that each teacher may know what has been done by the grade she has during previous years, and thus avoid repetition, which kills interest. This method enables us to progress in the subject from grade to grade.

My aim is to teach those things which have some influence upon our lives in some way or another. Thus we study plants and animals useful to man, also plants and animals which, directly or indirectly, are a detriment to man's interests.

The æsthetical, ethical, and religious growth comes with contact, but is not directly alluded to, for preaching kills.

My aim is to give the pupils something which is related to their own lives and the lives of others, and thus make them more useful men and women in after years.

Since I have changed my plan of teaching botany from that of knowledge for the sake of knowledge, to knowledge for the purpose of becoming better and more useful in the world, I find that the pupils have a new interest in the subject. It is a subject now with meaning and purpose, closely related to the lives of the pupils. Formerly, it was a subject to be memorized for the sole purpose of passing the examination.

I have not worked out my ideas fully in our course as yet, but have progressed far enough to satisfy myself that it is better than the old.

Assuring you that I appreciate your interest in our work, and hoping to hear from you again, I am, with kindest regards,

Very respectfully,
V. A. SUYDAM,
Principal Public Schools, Ripon, Wis.

I like this method of avoiding repetition, but to accomplish the object it is not necessary to avoid using the same subject. Some one has said in substance that truth is like an ocean, in which a child may play or an elephant easily get drowned. It is all in the manner of using it.

The director of the zoological department of one of our leading universities, once had a student who said of a requirement for the dissection of a grasshopper, "I don't want to do that. I had that in the kindergarten!" That is what one may call dilute science in the place of nature study.

And yet a grasshopper may be used in kindergarten or in university with profit and without repetition.

Said Linnæus to a pupil, as he laid his hand on a bit of moss: "Here lies sufficient material for the study of a lifetime." Perhaps some of us would regard that remark as a little hyperbolic, but if taken literally, without doubt we should all agree that the child's relation to the mosses is entirely different from that of the expert technical botanist. I suppose that it is the avoidance of repetition of relation that Principal Suydam has in mind. We may live for decades in the same home, but the point of view changes rapidly and opens up new vistas as years go by.

"The author knows by experience, both on the farm and in the schoolroom, that the possession of a better knowledge of nature by country youths is one of the crying needs of the hour. With such a knowledge generally diffused there would be less dissatisfaction with country life and fewer farmers' sons and daughters would flock to the cities, because, as a recent writer expresses it, "they wish to get rid of the prosy, stunting, isolated life on the farm." With a knowledge of some of nature's objects and a desire to ferret out for themselves some of her secrets, they would have something of which to talk and think besides crops, stock, work, neighborhood gossip and local politics, and the attractions of the city would seldom excel those to be found on the old homestead."—W. S. BLATCHLEY, in "Gleanings from Nature."

"It seems as if the day was not wholly profane in which we have given heed to some natural object . . . He who knows the most, he who knows what sweets and virtues are in the ground, the waters, the plants, the heavens, and how to come at these enchantments, is the rich and royal man."—EMERSON.

CHAPTER XXI

NATURE AND LIFE

Of all the subjects in this world, there is nothing so great to which we can give our attention as the world itself. Offspring of nature as we are, surrounded on every hand by her wonderful products and existences, it is no less than our duty to give her our earliest attention, as a powerful factor in the complete development of our own or of any other human life.

"Nature never did betray
The heart that loved her; 'tis her privilege,
Through all the years of this, our life, to leap
From joy to joy; for she can so inform
The mind that is within us, so impress
With quietness and beauty, and so feed
With lofty thoughts, that neither evil tongues,
Rash judgments, nor the sneers of selfish men,
Nor greetings where no kindness is, nor all
The dreary intercourse of daily life,
Shall e'er prevail against us, or disturb
Our cheerful faith, that all which we behold
Is full of blessings."

"It is of course evident that a scientific interest and an æsthetic interest in Nature Study are widely different things. The æsthetic interest is the result of the appeal Nature makes to our sense of beauty; the scientific, the result of the appeal she makes to our desire to know. If, in the case of the average man, we had to choose between them, it is at least doubtful whether it would not be wise to sacrifice the scientific to the æsthetic interest. The life of the average man is probably more enriched by the capacity to derive pleasure from listening to the knell of the parting day, from watching the lowing herd as it winds slowly over the meadow, than by a scientific interest in nature. But the two interests are in no wise antagonistic. And if the teacher of the nature subjects be herself a lover of nature, if she looks upon the changes that pass over the face of nature as spring blooms into summer, and summer fades into autumn, and autumn gives way to winter, with something of the same fondness with which the mother watches the changes in her child as she traverses the road to womanhood, there is no danger that the æsthetic interest of her pupils will suffer through a development of their scientific interest. Not only will the bugs and grasshoppers and butterflies, the trees and the leaves, the soil and minerals, claim her attention, but the broad valleys, the gently sloping hills, the sycamores bending over running streams and, as it were, gravely bowing to the trees on the other side; and her enthusiastic love of nature will be as contagious as her intense interest in science."—DR. J. P. GORDY, in "A Broader Elementary Education."

CHAPTER XXII

BOOKS AND NATURE

Indoor studies and outdoor studies, are they antagonistic or co-operative? They are both, anomalous as it may seem. The same is true in a comparison of city culture and country culture. Sometimes we observe the antagonism in the same person. We may see in our best poets, now the praise of books and now the praise of nature. A double spirit, a mingling in one, comparable to the mingling of the good and the bad of Stevenson's "Dr. Jekyll and Mr. Hyde." Wordsworth first sounds the praises of books:

> "Yet it is just
> That here in memory of all books which lay
> Their sure foundations in the heart of man,
> Whether by native prose, or numerous verse,
> That in the name of all inspired souls—
> * * * * * * *
> 'Tis just that in behalf of these, the works,
> And of the men that framed them, whether known
> Or sleeping nameless in their scattered graves,
> That I should here assert their rights, attest
> Their honors, and should, once for all, pronounce
> Their benediction; speak of them as Powers

Forever to be hallowed, only less,
For what we are and what we may become,
Than Nature's self, which is the breath of God,
Or His pure Word, by miracle revealed."

Then he declaims against books as injurious:

"Up! up! my Friend, and quit your books;
Or surely you'll grow double:
Up! up! my Friend, and clear your looks;
Why all this toil and trouble?

"Books! 'tis a dull and endless strife;
Come, hear the woodland linnet,
How sweet his music! on my life,
There's more of wisdom in it."

This double view is likewise shown in Lowell, whom Stedman styles "our representative man of letters," and adds, that "He is regarded as a fine exampler of culture." Lowell, though "the poet of nature," was pre-eminently a man of books. His writings and addresses were chiefly on literary subjects. Yet in a burst of passion for nature, the supremacy of a great surging part of his own character, he counts books and literary culture as of little worth, and in pleonastic verse makes them for the time shrink into nothingness:

"Jes' so with poets: wut they've airly read
Gits kind o' worked into their heart an' head,
So 's 't they can't seem to write but jest on sheers,
With furrin countries or played-out ideers,

Nor hev a feelin', ef it doosn't smack
O' wut some critter chose to feel 'way back;
This makes 'em talk o' daisies, larks, an' things,
Ez though we'd nothin' here that blows and sings,—
(Why, I'd give more for one live bobolink
Than a square mile o' larks in printer's ink)."

Books and Nature are antagonistic and yet they are co-operative. As Hamilton Mabie says:

"Since I turned the key on my study I have almost forgotten the familiar titles on which my eyes rested whenever I took a survey of my book-shelves. Those friends staunch and true, with whom I have held such royal fellowship when skies were chill and winds were cold, will not forget me, nor shall I become unfaithful to them. I have gone abroad that I may return later with renewed zest and deeper insight to my old companionships. Books and nature are never inimical; they mutually speak for and interpret each other; and only he who stands where their double light falls sees things in true perspective and in right relations."

I like that expression, "stands where the double light falls." There is a difference between the compound light and the extreme colors of the spectrum. One needs to *know* the details; *to live and see*, in the combination. The poet needs

the eye of the naturalist for his facts, and the naturalist needs "the light that was never on sea or land" for his life.

The quarry is antagonistic to the castle. The one must be depleted for the other. Yet both are co-operative; the first is useless and the second impossible without the other. The mine means something, it has its real value and beauty brought out only in the hands of the assayist. The two are antagonistic, yet co-operative. So you, teacher, must not merely go to nature for things, things, things, nor to books for words, words, words. One part of your mental make-up must be to lay hold of the real things of nature; the other must be to let in the illumination of books. Then only will you see facts in their true relations.

Remember always that the result is not to be naturalists and scientists, nor yet literati, but living men and women.

CHAPTER XXIII

"HUSH ALL THE CLASSES AND . . . HUG HIM"

He has a secret; wonderful methods in him; he is, every child, a new style of man; give him time and opportunity. Talk of Columbus and Newton! I tell you the child just born in yonder hovel is the beginning of a revolution as great as theirs. But you must have the believing and prophetic eye. . . . If a child happens to show that he knows any fact about astronomy, or plants, or birds, or rocks, or history, that interests him and you, hush all the classes and encourage him to tell it so that all may hear. Then you have made your school-room like the world. Of course you will insist on modesty in the children, and respect to their teachers, but if the boy stops you in your speech, cries out that you are wrong and sets you right, hug him!

And you, dear Ralph Waldo Emerson, how all child lovers should love you for that wise statement! You have practised what you preach; you have lived true to that other loving statement in your essay on "Education," "rather let us have men whose manhood is only the continuation of their boyhood, natural characters still." You had the boy nature in your heart, and sympathy for the spontaneity of the boy.

"Hush all the classes," and let the individual

child tell his story in his own way. Then, in that spirit, even if he disputes you, "hug him." Know with joy and love that you are educating, actually leading out individuality, not "minding" a series of buzzing spools and spindles on a school loom.

A few weeks ago at a teacher's institute, in a lecture on "School Discipline," a fellow instructor told of a teacher of physiology, who, to illustrate how the muscles are strengthened by use, referred to the arm of the blacksmith, and as an example, swung her right arm behind her back and over her head in windmill style that would have thrown a blacksmith into convulsions of laughter.

One of the pupils, who was a frequent visitor at a blacksmith's shop, was an interested listener. The reference to his good friend made his eyes snap and his heart beat. He was an expert in smithy work. He knew something, and he knew that somebody was wrong. But it was not his blacksmithing chum. Up went his hand with a confident flourish.

The teacher inquired, "Well, what is wanted, now, James?"

The little fellow replied, "Please, ma'am, I don't think the blacksmith swings his arm in that way. Mr. Johnson doesn't, anyhow; this is the

way he does," and his clenched fist flew up and down, and up and down, and banged the desk every time it came down, and did it gladly, too.

"Well, never mind," said the teacher; "we won't talk about that; we are talking about physiology now. We will consider that at some other time. But, James, when you speak you should not be so vehement, and your gestures should not be so violent. You should cultivate repose, James."

I was amazed, almost stunned, when that learned professor of pedagogy commended the teacher's action, as an excellent example of adroitness in avoiding a confession of ignorance, and of her skill in thus maintaining discipline. He claimed that if she had admitted her error, she would, to a certain extent, have allowed the school to get the best of her, and would, therefore, have lost her dignified hold of the discipline.

I claimed then, and I claim now, that it was a case in which knowledge was snubbed by ignorance, and the weak oppressed by the strong. Talk about losing the respect of her little men and little women! In the schoolroom, as in the greater world of which it is an epitome, there is nothing more repugnant than deceit, hypocrisy, or unfairness.

Had that teacher at once accepted the correction, with a few words expressing pleasure at the little fellow's power of observation in a field in which no one could expect her to be so well informed as the daily visitor to the blacksmith's shop, she would have gratified the boy and have won the good will and respect of all the little folks. Can you not see them all looking at James, and then at the teacher, with a pleased expression that says, "I wish I could have done that, told my teacher something she didn't know and got such a pleasant answer."

And then James; see him. How his eyes glisten with pleasure, but how embarrassed he is, and how he wriggles in his seat! It is so much good fortune, and it came so suddenly that it is almost uncomfortable. He is in haste to get home to tell about it; and eager, too, to see something else and tell his teacher, and so are the others.

But stop, we are dreaming, this was not the real situation commended by that professor of pedagogy. Drag yourselves back from the Utopia to the real thing. Look at the quick glances of the class as at a culprit; look at the assumed dignity on that teacher's face. Oh, James, I

want to hug you; and you, too, dear champion, Emerson, for you are right when you say:

> I believe that our own experience instructs us that the secret of Education lies in respecting the pupil. It is not for you to choose what he shall know, what he shall do. It is chosen and foreordained, and he only holds the key to his own secret. By your tampering and thwarting and too much governing he may be hindered from his end and kept out of his own. Respect the child. Wait and see the new product of Nature. Nature loves analogies, but not repetitions. Respect the child. . . . One burns to tell the new fact, the other burns to hear it.

The spirit of hushing the class to allow the child to speak, and of loving that child for what he tells of his own experiences and observation, is the spirit of nature study.

The dignity of that teacher, the unswerving class instruction, the claim that this is true because I say it is true, whether we call it science or whether we call it hypocrisy, is not the spirit needed to bring young folks into relation with nature. I do not state, nor even imply, that most of our teachers have this method of teaching what they term elementary science. Many excellent instructors in what they call science have the spiritual insight that I have styled the spirit of nature study. It is a commendable and enviable faculty, with which some of us, I fear,

have no speaking acquaintance. You must have, in justice to the little folks, the nature-study faculty, even if you do call it the teaching of science.

Call it what you will. If you are contending for class instruction, with a mass of facts presented according to schedule, and are ignoring individual interests, then out on such teaching. There is plenty of time in high school and college for facts, facts, facts, and science, science, science; banish them from the young folks' schools.

As Professor Hodge so truly puts it:

> Recent developments of the sciences have completely dazzled our modern education with their bewildering array of newly-discovered facts, and the temptation has proved irresistible to introduce their technicalities into the elementary curriculum. But the childhood of the race was very long, and we should not wish to force its period, brief at best, in the life of the individual. The weathering of rock and the formation of soil afford interesting lessons in modern geology; but men dug and planted, and established fruitful relations with Mother Earth thousands of years before geology was even dreamed of. So with combustion and the various forms of water: why not let children wonder about them for a few years, and then come with interest keen and fresh to their study in the chemistry and physics of the high school and college.

I heartily agree with this. Do not introduce technicalities into the elementary curriculum.

But do put in generous proportions of viewing nature that will "hush all the class and encourage him to tell it so that all may hear." Then, if you have the right spirit, you will want to "hug him," that bright little James.

That is the thing needed in the schoolroom; you may call it anything you please. I call it nature study "from the child's standpoint."

By the way, Thoreau said, "There is something of spring in all seasons." There should be something of the nature-study spirit in all school exercises, very frequently so "from the child's standpoint."

"All that is needed to give the child an impulse to talk is to fill his mind with facts that interest him. You may indeed by discipline, or by appeals to emulation or to the child's desire to please, create an artificial motive. But discipline which does not strengthen a natural impulse to action, appeals to emulation or to the desire to please for the sake of making a pupil do what he has no inclination to do at all, is perverted. What a child does under such influences is always done in a half-hearted, perfunctory way."

"The value of work, however, should not be measured by the acquisition of knowledge or the power to express it, but rather by the love and the sympathetic interest awakened in nature and the profound reverence for the design and the protecting care revealed in the works of earth and sky by an all-wise Creator."—ANNA E. McGOVERN, B. S., in "Nature Study and Related Literature."

CHAPTER XXIV

WOVEN INTO CHILD NATURE

"Is this Mrs. Durant?" inquired a caller, rising as the lady of the house entered the drawing-room.

"Yes, and you are Miss Plimpton, my Dorothy's teacher. I am glad to see you. I should have known you at once, even if you had not sent up your card, and in spite of the fact that this is the first time I have had the pleasure of meeting you."

"How is that?" surprisingly inquired the teacher. "I feel as though I were a perfect stranger, except to my boarding-mistress and the little folks in school. I have been so busy that this is my first call in Van Wert, but I have been here only three weeks."

"Let me explain that perhaps you haven't known just what you have been doing. I see that you are not aware that you have been calling on about forty families every day; that is, if all your pupils are like my little Dorothy. It is in this way that you multiply yourself. Dor-

othy plays keeping school, and morning, noon, and night we are served with Miss Plimpton in voice, in walk and even in every little action. So you see I am well acquainted. I recognized and welcomed your voice and manner as of at least three weeks' acquaintance."

There are good contagions and "catchings" of good things, as well as of bad things and diseases, in the life of every child. We quarantine from the bad, but too often, I fear, forget to supply the good. That supply should come from various sources, nature, associates, books, playthings, and the greatest of these is nature. Mother Nature is truly loved by the best that is in us, and never did she betray the heart that loved her. Let us weave her in large proportions into the heart, head, and muscles of the child.

The ingredients of child-life are fresh air, sunshine, trees, flowers, birds, and all the other happy life of the fields and forests. Weave in generous proportions. Do not skimp and carve, and trim, and minimize, and scrutinize too much. Pour in the generous cupfuls, hours rather than minutes. The strength, the happiness, the life, all are good. You appreciate them and the child needs them. Let him have them in their fullness of enjoyment.

You will cordially welcome and recognize the ingredients. They transform the whole make-up. There are the strength, the joy, the beauty, the purity.

"Culture consists less in wide knowledge than in wider sympathy; not so much in stores of facts as in ability to transmute facts into knowledge; not only in well-grounded conviction, but in toleration; not alone in absorption of wisdom, but as well in its radiation; in patriotism that is without provincialism; in the development of character. But since individual minds differ much in their composition, no one kind of treatment can be best for all, and the ideal system will be that which is elastic enough to allow each to receive what is best for it. True culture, then, cannot be obtained by forcing all minds into any one mould, however carefully that may be made, but it is rather attained by allowing each mind to expand for itself under a proper combination of nourishment from within and stimulus from without."—WILLIAM F. GANONG, Ph. D., in "The Teaching Botanist."

"Nature Study should appeal to the imagination; the artist and the poet should be called upon to help the child interpret the beautiful."—A. C. BOYDEN.

CHAPTER XXV

SOME TESTS OF PROFICIENCY IN NATURE STUDY

How shall we make these tests? The requirements are too intangible for measurement by the usual method. It is not so much "What do you know?" as "What do you appreciate?" Not so much the amount and detail of acquired information, as it is the extent of your ability and willingness to continue to acquire.

From the pupil's standpoint, the following model series of test questions, with answers, that merit high grading, has been given us by Principal Gowing of the Rhode Island normal school:

Question.—Do you enjoy going on rambles across the fields, through the woods and down the ravines to the meadows and swamps?

Answer.—Yes, sir.

Question.—Do you like to pick the flowers, hear the birds sing, and watch all forms of life?

Answer.—Yes, sir.

Question.—Do you select from the library and

read outdoor books that tell of nature's interesting plants and animal life?

Answer.—Yes, sir.

Teacher.—Marking, 100.

Then, too, there is an important observational, as well as a questioning, examination. The enthusiastic teacher will find it a pleasure to note the effects of nature study on the life and character of the pupils. If nature study gives pleasure for the time being only, it is still good; but if wisely and patiently done, it will surely refine the mind and open out avenues for active sympathy and helpfulness, and so uplift those who do not, at first hand, know anything of the teaching and refining spirit that Mother Nature imparts to those who communicate with her.

Tests for these results should be made, but they are not to be found easily in written monthly examinations. They will show themselves in little acts that may escape the notice of some teachers. Watch for these little evidences. They are among the most important tests of the proficiency of your pupils in nature study.

So much for the pupil. Now what shall be the test of the teacher? The writer suggests the following questions, not to be asked by others, but

as beneficial for self-examination. A conscientious teacher is her own best critic. Every one desires success, but success depends on fitness. If you are not achieving the results that you desire in nature study, look carefully for the causes. If you cannot mark at least "fifty per cent." on these test questions, and cannot soon bring them to a higher mark through your own efforts, then beg the principal to allow you to exchange duties with some other teacher who can lead your pupils in nature study. Adaptation and enthusiasm are keynotes to success. One hundred per cent. of teaching ability in science strongly implies, but does not guarantee, an equal grading in nature study.

Here are a few of the useful questions. They will suggest others adapted to special cases:

1. If I were to leave teaching and take up other duties, such as those of married life, for example, how much time each day would I devote or wish to devote to an increasing acquaintance with nature?

2. Do I regard the time devoted to nature study as a recreation, a duty, or a burden?

3. How much time each day do I devote to observing or reading about facts in nature that I

never intend to make use of in the schoolroom? That is, how much of my nature-study work is personal and how much utilitarian?

4. How long could I visit at an isolated home in the country, or at the seaside, and not find life a burden?

There is no element of injustice in question 1, as it may at first suggest. The right kind of nature study in its continuance under varied circumstances and vocations is not comparable to science, mathematics, or classics, but to music, poetry, general literature, and art. It should be a favorite avocation as well as vocation, a pursuit that recreates.

Now for a test as to the amount of nature study in a school.

1. After eliminating every method of viewing natural objects to which the term science may not be inappropriately applied, how much remains?

2. Without in the least detracting from the merits and advisability of correlating other school interests with nature study, take away all studies so correlated, and how large a nature study nucleus remains?

3. A country boy out of the schoolroom gets a vast amount of nature study, but very little of

science. Especially applicable to him is Emerson's saying that "The most important part of a boy's education is that which he gets to and from his way to school." How much of such country boy's relation to natural objects is there in my school?

Such questions, it seems to the writer, will be found helpful in bringing out the exact state of affairs in this informal acquaintance with nature as separated from exact systematic science yet perhaps leading to it. As nature study should lead to science, perhaps the best single question to pupil, school, or teacher is, "How much science does our nature study inspire?"

Or, from a more practical out-of-the-schoolroom standpoint, how much has your nature study led "to the end," as Professor Hodge has so admirably expressed it, "of doing those things that make life most worth the living?"

"The teacher who hopes to guide her pupils wisely will find it advisable to go directly to nature for inspiration; she must learn to know and to love the birds, the flowers, and the trees, if she hopes to lead her pupils to know and to love them; she must learn to observe in order to direct and test the observation of her pupils. After having studied, sketched and written descriptions of a few typical plants and animals and verified the descriptions by reference to good text books, a teacher will begin to realize something of the enjoyment in store for her pupils."—ANNA E. MCGOVERN, B. S., in "Nature Study and Related Literature."

The writer was once a boy himself, and vividly remembers the never-to-be-forgotten rambles and observations of the objects in the country; and moreover, as he treasures up such reminiscences as the most pleasant and innocent of an active man's life, he thought he could not do better than enlist this younger generation in the same loves and the same pleasures. He has endeavored to do his best for his human hobbies, and hopes their lives may be richer and sweeter and more manly, for what he has introduced them to in this book.

CHAPTER XXVI

INSPIRATIONS OF NATURE STUDY

In an opera-house in Clearfield, Pennsylvania, it was my pleasure and honor to occupy an easy chair on the stage and near the orator of the evening. How much I enjoyed that lecture, how I forgot opera-house, stage, easy-chair, everything except the speaker's eloquence and the pleasure of following his inspiring and virile thought, I cannot well describe. I shall never forget the memorable occasion, and I shall always remember the eloquent speaker's peroration. He was eulogizing the earth as an inspiration to any world that may succeed this one. His concluding words were those of the following beautiful poem by M. F. Butts :

A WHITE WATER-LILY.

" O star on the breast of the river,
 O marvel of bloom and grace,
Did you fall straight down from heaven,
 Out of the sweetest place ?
You are white as the thoughts of an angel ;

Your heart is steeped in the sun;
Did you grow in the golden city,
My pure and radiant one?"

"Nay, nay, I fell not out of heaven;
None gave me my saintly white;
It slowly grew from the blackness
Down in the dreary night.
From the ooze of the muddy river
I won my glory and grace.
White souls fall not, O my poet!
They rise to the sweetest place."

When the same speaker later invited me to write an article on some phase of nature study for his biennial Report of the Fish and Game Commission, I at once thought of his eloquent and impressive lecture, and with that as an incentive, as it has been during all these years, I have taken "Inspirations of Nature Study" as my subject.

And I assume the risk of seeming egotistical when I say that under this title I think can be properly portrayed the *real* aim of fish and game interests, for this title represents the vital substance of his entire report more truly than what he really spoke at the time. Fish and game! Why, the people for the most part care nothing for a fishing rod nor a ramrod, nor for the fish and game neither. They seek the inspiration of the woods. They are a lot of commend-

able, excusable, harmless, admirable hypocrites, although they don't know it or refuse to acknowledge it, or do so only with what Brer Rabbit calls "a spell of the dry grins."

General Sweeney's constituents nominally seek for a few pounds of fish and game, but in reality they go for the rest and the refreshment of nature. What a delicious lot of hypocrites are all these so called lovers-of-out-doors. They beneficially delude themselves. They are all in the same family, brothers and sisters with the mycologists whom Dallas Lore Sharp thus describes:

"And the *collecting* of mushrooms is, after all, their real value. Our stomachs are too much with us. It is well enough to beguile ourselves with large talk of rare flavors, high per cents of proteids, and small butcher's bills; but it is mostly talk. It gives a practical, business-like complexion to our interest and excursions; it backs up our accusing consciences at the silly waste of time with a show of thrift and economy; but here mushroom economy ends. There is about as much in it as there is of cheese in the moon. No doubt tons and tons of this vegetable meat go to waste every day in the woods and fields, just as the mycologists say; nevertheless, according to

my experience, it is safer and cheaper to board at a first-class hotel than in the wilderness upon this manna, bounty of the skies though it be.

It is the *hunt* for mushrooms, the introduction through their door into a new and wondrous room of the out-of-doors, that makes mycology worthy and moral. The genuine lover of the out-of-doors, having filled his basket with fungi, always forces his day's gleanings upon the least resisting member of the party before he reaches home, while he himself feeds upon the excitement of the hunt, the happy mental rest, the sunshine of the fields, and the flavor of the woods."

Consciously or unconsciously to us the woods and fields, the meadows and ravines are calling us to our own. They are inspiring us to seek a higher life. They want us to be like them.

> "We are what suns and winds and waters make us;
> The mountains are our sponsors, and the rills
> Fashion and win their nursling with their smiles."

And how readily comes the response in a language varied, but always signifying the same thing. As Thoreau has expressed it, "I would be as pure as ye, O woods!" They are as nature originally makes them or as she later fashions, cuts and trims them. This may be through

icthyology, ornithology, botany, geology, photography, art or poetry. Like the spokes of the wheel held in by the tire, all pointing to the hub, so the various occupations, struggles and tensions of mankind, all eventually lead to attempted restoration by the soothing hand of nature.

In my back yard, in a wire cage about ten feet long, I have a brood of ducks. It is amusing, especially to the young folks, to see the characteristic and unique manner in which these fuzzy waddlers take their food. Since we have learned that they must have one or two sips of water between every few mouthfuls of food, we have, in order to add to the entertainment of the row of youngsters, who so often come to watch them, placed the dish of food at one end of the cage, and the pan of water at the other. Laboriously the birds scoop up the food in their broad bills, and strenuously jerk their heads back and forth to shake it down their throats. The material things of life are serious matters to them. They continue their exertions as long as they can, and then wearily waddle over to the basin of water and delightedly take a few sips. Now the labored "quacks" give way to a sort of musical chipper,

as they gleefully trot back to the strenuous work of getting a living. The row of young folks see lots of fun in all this.

But isn't it after all an epitome, a sort of parallel, to what a visitor from another planet might observe if suspended in a balloon over this weary, living-getting world of ours? The people are the ducks, the basin of food the place of occupation and the vessel of water the seaside, the lake, the rivers, the books, the fields, the mountains, the wilderness. Vigorously we labor at the centre of material things, then tired out with much work, or large accumulations, or both, we hurry away for the dilutant, or that which shall make us digest, absorb and enjoy all that we have succeeded in picking up in the scramble. Every train load of excursionists to or from a city reminds me of those ducks hurrying to or from the food and the water. You can always tell by the appearance of the people (and of the ducks, too !) which place has been visited last, even if you canno surmise it from the point of the compass which they are leaving, or that toward which their faces are looking.

My son, who attends to the needs of these ducks, stops me at this point, and says that he has dis-

covered an error in the parallel. He makes the suggestion that there is a blunder in my figure of speech. He says: "They don't act that way so often when they get older. It is only when they are young that they are so erratic. Then they take a sip between every mouthful, but when they get older, the members of the flock drink only once or twice during the entire meal." This suggestion of an error in the parallel but points out all the more effectively the truth of what I maintain. This alleged discovery, instead of crushing me and my parallel, actually proves my position, makes my comparison all the more impressive and my meaning all the more incisive. The younger folks should go and need to go to nature more frequently than their elders; indeed they should be almost constantly in the presence of nature. This is the true theory of the kindergarten. Liberal and continuous sips of nature. The business man can be, must be, content with one or two or refreshing drops now and then in the form of a few hours or of a few days' vacation from the office, or with a more exhilarating "drink" that shall last for a week or a month in the woods once a year. An author can labor continuously on a book or two, then back he

must go to nature for a long, refreshing recuperating draught. John Burroughs says of the man who writes:

"I once saw a cow that had lost her cud. How forlorn and desolate and sick at heart that cow looked. No more rumination, no more of that second and finer mastication, no more of that sweet and juicy revery under the spreading trees, or in the stall. Then the farmer took an elder and scraped the bark and put something with it, and made the cow a cud, and after due waiting, the experiment took, a response came back, and the mysterious machinery was once more in motion, and the cow was herself again."

Have you, O poet, or essayist, or story-writer, never lost your cud, and wandered about days and weeks without being able to start a single thought or an image that tasted good,—your literary appetite dull or all gone, and the conviction daily growing that it is all over with you in that direction? A little elder-bark, something fresh and bitter from the woods, is about the best thing you can take.

Bryant also tells us that the author must make visits to the "lonely stream" for refreshment and inspiration:

"Though forced to drudge for the dregs of men,
And scrawl strange words with the barbarous pen,
And mingle among the jostling crowd,
Where the sounds of strife are subtle and loud—
I often come to this quiet place,
I breathe the airs that ruffle thy face,
And gaze upon thee in silent dream,
For in thy lonely and lovely stream
An image of that calm life appears
That won my heart in my greener years."

David says, "I will lift up mine eyes unto the hills from whence cometh my strength."

The child, the business man, the teacher, the housekeeper, the writer, the minister, everybody seeks inspiration from nature, everybody is a naturalist, or a student of nature in spite of himself. The fisherman and the sportsman are members of one branch of the many that form the great company which we style "everybody."

May fishermen and sportsmen "confess and forsake" their cruelty; may they get their out-of-door inspiration, and their collection of fish and game chiefly by means of the camera and not by rod and gun. When his followers go out with their nerves stretched to the breaking point, and their shoulders bowed beneath the load that civilized life heaps upon them, until they ache and sting and throb with the pain of such living, may

they return from the water as gleefully as do my ducks. All nature shall combine to win them. Even the grass by the brook along which they cast the artificial fly, shall add to this inspiration. Says Richard Jefferies :

"As a few strokes from a loving hand will soothe a weary forehead, so the gentle pressure of the wild grass soothes and strokes away the nervous tension born of civilized life."

The carol of a bird is more soothing to weary nerves than the explosive bang of a gun, and never harmful to any living creature. A wild rose in the buttonhole is as valuable, and as nourishing to one's esthetic nature, as a dead fish to his animal instincts. The tendency of most of us is to allow the animal within us to develop at the expense and final extinction of the spiritual. The slightest observation, even a casual reading of the daily newspaper, will prove that. We shall be better for this world, and for the next one too, if we can have a few more bird songs and a few more wild roses in our daily experience.

APPENDIX

HOW TO INTRODUCE NATURE STUDY

By Prof. H. A. Surface.

Economic Zoologist of Pennsylvania and
Professor of Zoology in Pennsylvania State College.

Many persons are asking if they should introduce Nature Study either in the home or in the school, and how it should be done.

The method of introducing the study depends upon the surrounding conditions, and the motives for its introduction. If the conditions are such that the children or class cannot have a regular daily period devoted to the subject, the best results cannot be obtained, yet something can be done, as we have seen, toward awakening an interest in nature. It is possible to lead pupils to see things and understand their significance without devoting a separate period to the special subject.

Again, if there are certain features of the subject that the teacher does not understand, it is better to ignore them and teach those parts

that are well known. Also, if the teacher does not know how to teach it by the proper methods to insure the best results, there will be no greater merit or value in this subject than in any other. That part of the subject to be taught should also depend upon the specimens that occur in the vicinity or can be obtained. The teacher must derive lessons from natural objects rather than use specimens merely to illustrate points made in the lessons.

When it is decided (1) that a regular period is to be given the subject, (2) that the teacher knows enough about it or some part of it to treat definite valuable points, (3) and is able to teach it in a way to make the primary object or purpose the development of thought, instead of merely to give instruction, and (4) suitable material can be procured from which to derive facts, then it is time to introduce nature study and anticipate the best results from hard work. But it will require application and effort in this, as in all other pursuits. There is no royal road to success, and nature study is no panacea for all the educational ills of our public schools. Certainly it is possible to make this subject of just as great intensity, and of as great cultural value, as any other known sub-

ject, and we really believe that when properly taught it has greater possibilities than has any other subject that can be undertaken. Since the purpose is to help students to think, this cannot be done unless the instructor thinks even deeper and harder than do the persons whom he undertakes to train.

If the subject is to be introduced into a system of schools, by far the best possible way is to engage the services of a competent specialist in this line, to place it upon such a footing that it can in a few years be taught entirely by the regular teachers.

If an individual teacher wishes to introduce it, all that is necessary is to observe, or read about some common objects of nature; learn for himself some features of interest about them, and then procure specimens of these objects, and placing them before the pupils, start them in the process of thinking or discovering for themselves the truth or facts which the teacher has learned (no matter by what means) about this material or phenomenon. It is best to have the specimens come from the surrounding neighborhood, and if possible collected by the pupils themselves. The same material can be used in any and all grades

if the intensity of treatment is made to vary accordingly.

It is advisable, when possible, to plan a general series or course for the year, considering the kind of material that is readily accessible, or phenomena that can be observed at successive dates. Although class excursions for outdoor study are very valuable when they are conducted with but few persons, they cannot be relied upon with full rooms, as many experiences have proved that they are not at all practicable. Try them, and under certain conditions field excursions may be found a valuable feature of nature study. These essential conditions are (1) that a suitable time be found for such excursions; (2) that the size of the class be reduced to a number that can be handled to advantage in the field, usually not more than fifteen; (3) that the teachers know where and how to go, and what to do and how to do it. Although there are so many contingencies here outlined that it appears discouraging, it is far better for our readers that these conditions be pointed out, than that they should have to learn them by the actual, sad experiences that have befallen teachers and parents in various places, who have attempted to follow the many impracticable

suggestions of a number of advanced theorists in education.

It is certain that the advanced and theoretical advocates of field studies will propose various solutions for these practicable problems (practical persons show that there are such difficulties), but they always involve us in troubles as great as those from which we seek to escape. To be clearly understood, we should say that while we have found field studies to be the soul and life of the work in university and college courses, we cannot advocate them for grade pupils, under the surroundings or conditions that confront the average teacher.

The following short rules have been derived as the results of years of personal experience, and may prove of value to both teachers and parents:

1. Begin every lesson by showing either a specimen or an experiment, or by asking a question about some observed phenomenon.

2. Direct pupils to observe nature whenever they are out of the house.

3. Have pupils keep note-books of every feature of the progress of the seasons.

4. Direct pupils to collect such specimens as

are needed, telling them just how, where and what to get.

5. Watch the markets, and make use of the material they bring within range.

6. Have pupils describe and name an object and describe its parts, before you teach them its functions, habits, etc. This is "the study of structure before that of functions."

7. Never tell pupils anything that reasonable effort can lead them to learn for themselves. They become "doers by doing."

8. Commend all voluntary observations and individual studies on the part of a pupil.

9. Do not make the lessons so elementary as to make thinking unnecessary on the pupil's part, and do not permit them to degenerate into mere object lessons.

10. If there is a good prescribed course available, follow it with care; but if not, use any material obtainable, remembering that the aim is culture, not instruction.

11. In order to teach yourself more about the subject, do not hesitate to ask questions, by correspondence or otherwise. Remember it is not essential that the instructor should learn all his

facts by the observational method which he asks his pupils to adopt.

12. Review the subject in a good summer school of the right kind, where both profit and recreation may be obtained.



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